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ABSTRACT

This review examines the accuracy and the concurrent and predictive validity of brief self-report information, and evaluates the promise and problems involved in its practical use. In section one, the power of self-report information for predicting and understanding grades is reviewed. In the second section, research on the influence of background and personal information on students' progress through higher education is summarized. The third section deals with the prediction of creative or high level accomplishment. The fourth section reviews the increase in the understanding of students' educational backgrounds that biographical information provides. In the fifth section, the power of biographical information to predict vocational choices and vocational success is reviewed. The sixth section is a review of the technical and theoretical requirements of effective biographical and self-report information systems. In the last section, the general functions of biographical data are considered. Throughout the review, emphasis is placed on predictive validity of the measures in educational settings because the power of a variable to predict later performance or choices is necessary before the variable can be used for guidance or sectioning. However, wherever warranted, other aspects of the use of self-report information are also discussed. (RC)

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Using Self-Reports to Predict Student Performance

Research Monograph Number 7

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College Entrance Examination Board, New York, 1976

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Introduction

This is a brief review of some of the studies that have examined or demonstrated the value of brief assessments of students' past and current educational and personal characteristics. It concentrates on measures that have been used in educational settings, although some industrial applications are also discussed. In spite of its length, it really is a brief review, because the studies included have been selected from a much greater number of articles and research reports. Some of the information studied is biographical in a strict sense, referring to students' previous activities, family history, etc. However, most of the reviewed studies have used brief measures, such as self-ratings and self-expressed vocational choices.

The instruments reviewed are relatively specific measures that obtain information about a person's past experiences, current status, or needs. Many rely on the individual's self-expression or self-evaluation of his characteristics, plans, motives, and goals. The scope of the review is necessarily broad so that it can include the wide variety of information that has been used in the major studies of brief self-report information. Two aspects of the instruments should be emphasized: brief self-report assessment tends to be direct rather than indirect, and it is based on self-expressions rather than scales composed of diverse, subtle items. Of course, these distinctions tend to become fuzzy when they are applied to devices that yield scales based on biographical items, or when biographical items are used for purposes other than the purpose their content would indicate. In general, however, they seem to offer a serviceable delineation of the area. In reviewing this area, emphasis is placed on the utility of the measures.

Tests of many kinds are extensively used by admissions officers, counselors, and educators. Intense intellectual effort and great amounts of time and money have been spent on their development and use and on technical and theoretical models of tests. In contrast, relatively little attention has been devoted to information directly available from self-report instruments. Use of information of this type has also often been neglected. This review of the uses and research on biographical and other self-report information does not support this lack of attention and use, and, in a sense, is an attempt to study the viability of this information as "first-class variables." Therefore, this review outlines some of the general functions of biographical and other self-report information, research relating to its specific uses, some theoretical and technical models for using questionnaire information, and some of the implications of self-report research for practice and theory.

In short, the purpose of this review is to examine the accuracy and the concurrent and predictive validity of brief self-report information,

and to evaluate the promise and problems involved in its practical use. The issues are reviewed in several areas. In the first section, the power of self-report information for predicting and understanding grades is reviewed. Grades are important in academic life, and they can have critical effects on the lives of students. It is therefore as important to understand the nature of academic success as it is to be able to predict it. Self-report information adds to that understanding. In the second section, research on the influence of background and personal information on students' progress through higher education is summarized. The third section deals with the prediction of creative or high level accomplishment. Biographical information about individuals' past accomplishments have consistently been found to predict later high level accomplishment better than does any other class of information. The fourth section reviews the increase in the understanding of students' educational backgrounds that biographical information provides. In the fifth section, the power of biographical information to predict vocational choices and vocational success is reviewed. The sixth section is a review of the technical and theoretical requirements of effective biographical and self-report information systems. In the last section, the general functions of biographical data are considered. Throughout the review, emphasis is placed on predictive validity of the measures in educational settings because the power of a variable to predict later performance or choices is necessary before the variable can be used for guidance or sectioning. However, wherever warranted, other aspects of the use of self-report information are also discussed.

Before turning to the educational uses of brief assessment, one question must be dealt with immediately. This question is whether individuals' self-reports can be believed. To be blunt, how do we know that people won't lie?

The validity of direct measure per se

Beyond obvious and innocuous information such as his vocational choice or hometown size, can or will a person give an accurate account of his history and present status? The few studies of the validity of self-reports provide a fairly consistent answer to the question. As early as 1937, Walker found that college students' reports of such factual information as their father's occupation and class standing agreed very well with official records. Harris (1946) found high validity for a questionnaire he used in a psychiatric setting. Mosel and Cozan (1952) reported high validity for application blank work histories in industrial settings. They found a high level of agreement between the claims made by job applicants and the reports of past employers with respect to weekly wages, duration of employment, and job duties. All correlations except one were .90 or greater. Hardin and Hershey (1960) found that when workers' reports of their wages on a questionnaire were checked against company pay records, the worker and company figures correlated .98 among women, and .99 among men. About eight percent of the sample under- or over-stated their pay by plus or minus six percent. Interestingly, about three times as many employees understated their pay as overstated it. Clausen (1968) compared self-reports of voting in elections to official records and found an "invalidity" rate of approximately 6.9 percent. He cautions that this may be an overestimate, for: "All errors that lead the investigator astray in tracking down the record of the respondent's vote, e.g., incorrectly spelled name, incorrect address, have the one-sided effect of challenging the validity of the respondent's vote report." This is a very important point to remember in every study of the validity of self-reports. One should not simply assume 100 percent accuracy in official records and the reports of those records.

Calahan (1968) asked a number of Denver

ing questions ranging from whether they had a phone in their homes to whether they contributed to the Community Chest. The self-reports on many factual questions were quite accurate (home ownership, 96 percent accurate; valid library card, 87 percent accurate; voting in 1948 presidential elections, 86 percent accurate) while some more socially desirable and rarer behaviors were reported with less accuracy (contributed to Community Chest drive in 1948, 56 percent accurate). After a variety of analyses, Calahan noted that accuracy was higher for items concerned with present fact, and suggested: ". . . respondents generally will tend to tell the truth even when it may reflect on their prestige, provided that the question of fact concerns the respondent's present status rather than past events."

In samples of college students, Walsh (1967, 1968, and 1969) has found that students generally provide accurate reports of their past behavior, even when items deal with sensitive issues, failing courses, for example. However, Calahan's comments seem to apply to college students, as well. Thus, Walsh's students seemed to have a little difficulty recalling remote or insignificant events, but, ". . . if an error of plus or minus .20 was permitted in a student's report of his previous semester GPA, then the percentage of accuracy would be 100 percent." Overall, Walsh found a very high level of accuracy. In addition, Walsh did not find any difference in accuracy among interview, questionnaire, or "personal-data blank." In his later studies, Walsh found that the level of accuracy of self-report was not changed when students were given financial or social incentives to distort their self-report. Studies of the validity of self-reported grades reviewed in the next section also indicate that students generally provide quite accurate information about themselves.

As part of a comprehensive study of the accuracy of self-reports on a questionnaire administered with a national college testing program, Maxey and Ormsby (1971) studied the agreement between student-reported and school-reported nonacademic achievement on 28 items. (They also studied the accuracy of self-reported grades, of which more later.) Their sample included 5,775 students completing the American College Test Assessment (ACT) battery. Student reports were checked with school reports in 134 high schools. Achievement was measured in athletics, leadership, music, speech, drama, art, writing, and science. Measurement items included, for example: "Edited a school paper or yearbook," and "Placed first, second, or third in a regional or state science contest." The average level of agreement between student report and school records was about 90 percent. But this did not mean that 10 percent of the students were exaggerating. On the typical item only about 6 percent of the students claimed an accomplishment for which the school had no record. The other four percent of the students were credited by the school with an achievement they themselves did not claim. The items on which agreement between the two groups was greatest tended to be highly visible, easily verifiable items, for example: "Placed first, second, or third in a regional or state speech contest." Conversely, the items on which there was less agreement tended to be behaviors about which the school would have little information, for example: "Actively campaigned to elect another student." No systematic differences in agreement were found when the data were broken down by sex or family-income level. The reports of students who made better grades agreed with school reports slightly less frequently than with those of students who made lower grades. The authors think this may be because of a tendency for students with higher grades to be more active in school social activities in ways that are unknown to school personnel. The fact that the students' reports of achievement were gathered at the same time that the students were completing a national assessment for college admission leads one to expect the

reports to be exaggerated. The fact that they tended not to be adds strong support to the idea that self-reports are accurate.

In brief, from the limited evidence available, it appears that questionnaire responses have useful validity for the types of decisions and actions for which they will be used. Self-reports seem to be accurate when they deal with matters that are fairly recent, relevant to the person's present interests and concerns, verifiable, and, as we shall see in this review, when the questions are phrased in the best way. Although the evidence is fairly consistent with this generalization, there are several gaps in the current research literature. In particular, few studies have examined the validity of self-report among subgroups, such as ethnic minorities or disadvantaged students. (Freeburg, 1974, however, found correlations in the .70's between self-reports and records on topics as sensitive as the number of police contacts among disadvantaged school dropouts.) Clearly, more work is needed.

In the following pages, the concurrent and predictive validity of self-report information is examined. It is often as valid as more extensive and expensive tests in similar areas. This evidence suggests that one can believe and make decisions based on self-report information in a wide variety of areas as much as one can believe and use test information.

Section I: Predicting and understanding academic criteria

This section is concerned with the utility of biographical and self-report information in the prediction of grades. As criteria, grades evoke many general questions about the use of biographical information, and therefore provide a logical place to begin a review. The questions include, among others: "Are biographical or self-report questionnaire responses valid; can they be believed?" "Are they related to anything; do they predict criteria we are interested in?" "How do they compare with and add to information provided by tests?" and "Do they add anything to our understanding of the phenomenon with which we are concerned?"

Self-reported grades

The first and perhaps most critical question is whether students' self-reports of grades and class rank can be believed, and whether they are valid as predictors. The evidence on these questions begins as long ago as 1940 when Perry found correlations between school-reported and self-reported grades of .83 for high school students with grades above 80 percent and a correlation of .66 for those below 80 percent. Dunnette (1952) reported a correlation of .94 between school- and self-reported grades. More recently, research by Davidsen (1963) yielded a correlation of .93 between self-reported and high-school-reported grades in a large sample of students who were applying to college and who knew that their reported grades would be part of the basis for admission.

In a more recent sample, Hanna, Bligh, and Lenke (1970) reported a study of 1,105 eighth grade students in six states. Their figures were gathered by area, as well as by summing over four areas. The correlations between self-reported and school-reported grades in mathematics were .88; in science, .84; in English, .84; and in social studies, .84. When grades were summed over all four areas, the correlation was .93. This study is particularly important because the students were eighth graders and reported their grades on simple four-point scales. In addition, Hanna, Bligh, and Lenke reported the means and standard deviations of student- and school-reported grades. The largest reported difference in means was equivalent to a difference of .15 on a four-point scale.

The studies by Walsh (1967, 1968, 1969) reported earlier used criteria of "accuracy" of a student's estimate of his GPA during his last semester. It is possible that Walsh's estimates of accuracy are conservative, since many students who were not on academic probation or on scholarship would have no reason to calculate a precise GPA, and so were required to guess. If they had been asked to estimate their approximate overall grade (A+, A, B+, B, etc.) the same students may have been able to give a more nearly

accurate response. This approach was used by Richards and Lutz (1968) who found that measures of this type correlated .84 and .86 with college reported GPA's among men and women respectively at 19 four-year colleges. The same figures were .85 and .87 at 13 two-year colleges. In another sample of students at 27 two-year colleges, Baird (1969b) carried out similar analyses and found the correlations to be .83 and .86 for men and women. In both these studies the means of the college-reported and student-reported grades represented almost identical values.

An unpublished study by the author (Baird, n. d.) found that this level of correlation was consistent in eight separate multi-institutional samples. This study also found that the correlations generally were of the same magnitude (median = .87) in separate colleges (well over 100 separate colleges) as well as in the total samples; that is, the correlation was not due to the pooling of students at varied institutions. Considering the simple self-report scale, and the nature of college grades, this figure (.87) is probably close to the limits imposed by the reliabilities of the variables.

Using a sample of the very bright National Merit scholars, Nichols and Holland (1963) found self-reported and transcript-reported grades to correlate .96. The largest discrepancy was one student's change of a C to a B. Nichols (1966) also found student- and school-reported grades to correlate .83 and .82 in another sample of Merit scholars. Presumably, these students would be concerned about obtaining and retaining scholarships and might have been expected to distort reports of their grades.

At the graduate level, Kirk and Sereda (1969) asked Berkeley architecture students to report their grades and found a high degree of accuracy: 43 percent reported exactly correct grades, 78 percent reported grades differing ±.1 from their transcript GPAs, and 92 percent were within ±.3 of their actual grades. The largest discrepancy reported was .7. The correlation between transcript- and self-reported grades was .95.

Boldt (1973) compared the self-reported and school-reported grades of 4,200 students in nine high schools. The self-reported grades were obtained when the students took the Scholastic Aptitude Test and completed the Student Descriptive Questionnaire. The median correlation was .87. Boldt concludes: "... one can see that more than 98 percent of the grades reported were either exactly right or only one off—there is a very small tendency to overrate oneself but much smaller than the tendency to be accurate." Each student reported grades in mathematics courses, English courses, etc. Boldt found that 79 percent of the grades were reported exactly right.

In what must be regarded as at least an exhaustive study, if not the definitive study, Maxey and Ormsby (1971) studied the correlations between students' self-reported grades and school-reported grades in a sample of 5,775 students in 134 schools throughout the country. As in the Boldt study, the grades were gathered as part of a standardized national testing battery. The students knew that their self-reported grades would be reported to colleges where they were applying for admission. Overall, the correlations ranged from .81 for natural science grades to .86 for grades in English. On the average, 98 percent of the students reported grades accurate within one grade, 78 percent reported exactly accurate grades, 16 percent overrepresented their grades by one (or more) grades and, interestingly, 6 percent underrepresented their grades by one or more grades. The authors believe that even this high level of agreement may be an underestimate.

"In the last 7 years more widespread use of honors courses is included in high school curriculums. This introduces a dual grading system, and it is possible that some confusion results when students report grades earned in honors courses. Secondly, multiple courses in the various subject matter fields are now offered, and consequently it is difficult for the student to determine what

course grade should be reported. For example, many students report psychology as a science course, but others do not. This may lead to some confusion when school officials report a science grade as some may interpret it as a nonscience course when the student has interpreted it as a science course. Thirdly, when students are asked to report the last grade earned in a course, they may interpret this as the final examination grade or 9-week grade rather than the semester grade." (Maxey and Ormsby, 1971, pp. 10-11)

In addition, the authors analyzed their data by various student characteristics, and found no consistent differences in accuracy among students of different race, family income, or size of high school class. Girls were a little more nearly accurate than boys, as were students with higher degree aspirations, and those who scored higher on the college admissions test. These differences are not large, however. Maxey and Ormsby make two additional points: first, because the grades of college-bound students cover a restricted range, the correlation between self-reported and school-reported grades would be even higher if the full range of students were studied; and second, the fact that students applying to college report accurate grades although they may be motivated to put themselves in a favorable light gives strong support to the proposition that self-report information is valid.

Armstrong and Jensen (1974) conducted an extensive study of the accuracy of self-reported grades of some 2,775 randomly selected applicants to colleges in the Massachusetts State College System. The source of information was the Student Descriptive Questionnaire, completed by students when they take the SAT. Overall, they found that 71.7 percent of all student-reported grades agreed exactly with transcript grades, and that 97.4 percent agreed within one grade. Although 21 percent overrepresented their grades by one or more grade, 7 percent underrepresented them. The researchers reported a correlation of .74 between student- and transcript-reported grades. Searching for the sources of discrepancies between student- and transcript-reported grades, they conducted extensive analyses of the options available to students in the SDQ. They found that the SDQ questions needed to: take account of multiple grades in the various academic areas assessed; provide better options for non-conventional grades; provide clearer instructions to students who had not taken courses in an area; eliminate the use of the term "semester" because it is not commonly used in high schools; provide examples for students to use as guides; define "social studies" more precisely; encourage students to check their grades with authorities if they are in doubt about them; and use a common time-point for all students, such as "end of junior year." These all seem to be useful suggestions and perhaps indicate that many students who have reported grades that are different from school-reported grades were confused by the format of the questions, and had responded as well as they were able to do. They probably did not intend to lie; they simply gave their best response to items that seemed ambiguous to them.

Armstrong and Jensen also examined a wide variety of variables that might be related to discrepancies between student-reported and transcript grades. They found that students who had higher SAT scores and higher high school grades tended to report fewer discrepant grades than students who stood lower on these measures. They also found a lower incidence of discrepant reporting among: out of state applicants; financial aid applicants; BA or MA aspirants; women; applicants from college preparatory programs; applicants from large high schools; and applicants from public high schools. No differences in reporting were found in breakdowns on the following variables: full-time/part-time/evening attendance plan; New England residence; marital status; housing plan; family income; and ethnic group.

From all their analyses, the authors concluded:

"It seems reasonable to conclude that applicants reported their grades accurately to the best of their ability, with few exceptions. Confusion generated by the directions in the version of the SDQ to which applicants included in the present study responded was apparently responsible for most of the lowered level of precise accuracy noted in the present study as compared with previous research." (p. 100)

Some college administrators and admissions officers may accept the overall results of the Maxey and Ormsby and Armstrong and Jensen studies, yet retain doubts about the accuracy of students' grade reports when they apply to certain colleges. They may suspect that students who apply to highly selective colleges will distort their grades to a greater degree than will students who apply to other colleges. They may also suspect that low-ability students might be tempted to distort their grades when they apply to moderately or highly selective colleges, moderate-ability students when they apply to highly selective colleges, and so on. To study these possibilities, Hanson and Lamb (1973) compared the school- and student-reported grades of 2,255 high school students who applied to colleges that varied in selectivity. The students indicated the colleges they wished to apply to when they took the ACT assessment. Their first-choice colleges were designated as low, moderate, or high in selectivity, based on Astin's (1965) measure of selectivity. The percentages of students who reported grades in exact agreement with their schools' report were 81.8 percent among students applying to colleges low in selectivity, 83.5 percent among the students applying to colleges moderate in selectivity, and 75.9 percent among the students applying to colleges high in selectivity. The corresponding figures for underreporting grades were 3.7, 3.7, and 5.7, and the figures for overreporting grades were 14.5, 12.8, and 18.4. These figures show that there was a slightly greater discrepancy between school- and student-reported grades among students applying to highly selective colleges than among students applying to other colleges. It is interesting that underreporting of grades seems to increase along with selectivity as well as does overreporting of grades. Hanson and Lamb also examined the same relations between selectivity and agreement between student- and school-reports of grades for students who differ in ability. Overall, they found that the percentage of students whose reports of grades agreed with school reports increased with the ability of students. The specific results were complex, but among the students who sought admission to highly selective colleges, the level of exact agreement in the first three quartiles of ability was approximately 72 percent. In the top-ability quartile, the level of exact agreement was nearly 87 percent. It is probable, then, that the high-ability students who are more likely than other students to be seriously considered by highly selective colleges are also more likely to report grades that agree with their school reports.

In short, research accumulated over 30 years, using various methods, in samples of grade school students, high school students, college applicants, junior college students, four-year college students, and professional school students adds up to one conclusion: students' reports of their grades are about as usable as school-reported grades. This conclusion seems particularly valid when one considers the conditions involved in some of the studies. That is, even when students were faced with the pressure of maintaining scholarships, applying to college, and deliberate experimental attempts to get them to change their responses, they continued to tell the truth.

But what about the rare students who do not give responses that are consistent with school records? What can be done about them? Kirk and Sereda (1969) studied students who reported discrepant grades, and the authors suggest that these students may have particular characteristics that could help to identify them. They found that students reporting discrepant grades tended to have

parents of less than average education, were more academically oriented, more ambitious, and less social. Typical discrepant reporters had parents who were not well educated themselves but who placed high demands and expectations on their children, tending to cause the children to be highly motivated to achieve.

This description seems plausible, and leads one to expect that further research would find a pattern of variables on a biographical questionnaire that would lead to identification of students who are likely to exaggerate their grades. Such a pattern would be roughly analogous to the "lie" scales on personality and interest tests. The school-reported grades of students who scored high on such a scale could be checked.

Self-reported grades as predictors

Given the fact that self-reported grades seem to be accurate, are they valid as predictors? The research answer to this question is positive, although it has not been substantiated in as many settings. In a study by Hoyt (1963), the predictive efficiency of average self-reported grades equaled that of the student's high school rank obtained from his transcript. In two of the studies cited earlier (Richards, Holland, and Lutz, 1967; Richards and Lutz, 1968), self-reported high school grades were better predictors of college grades than tests of academic aptitude. Moreover, these self-reported high school grades generally had substantially larger beta weights (added more to the prediction of grades) than did the test scores.

Similar results were obtained for students in samples of both occupational and academic students in two-year colleges by Baird (1969b), in a sample of average college students (Nichols, 1966), and in a number of National Merit samples (Nichols and Holland, 1963; Holland and Nichols, 1964; Nichols, 1966). For example, Baird (1969b) found that among two-year college women, self-reported high school grades correlated .44 with college grades after two years, while a college admissions test correlated only .31. The corresponding figures for women were .54 and .39. Hanna, Bligh, and Lenke (1970) found that self-reported eighth-grade grades predicted grades in ninth-grade algebra and geometry about as well as school-reported grades (.55 and .57 in algebra; .62 and .62 in geometry), and that they were exactly equivalent in prediction efficiency when combined with test scores (.62 in algebra; .63 in geometry). Hoyt and Munday (1968) summarized the results of validity studies conducted by the American College Testing Program for 437 colleges between 1965 and 1967. A total of 273,000 students were involved. They found that student-reported high school grades were better predictors of college grades, on the average (the median correlation across colleges was .54), than were the ACT tests (the median correlation was .48). The American College Testing Program (1973) made a similar survey for the years from 1968 to 1970. In studies conducted for 419 colleges, involving 298,000 students, approximately the same results were obtained. Student-reported grades were better predictors than the ACT tests, on the average (the median correlations were .51 and .47, respectively). Of course, the average multiple correlations using both student-reported grades and ACT scores were higher than either alone. Cole (1969) found that self-reported high school grades were superior to the ACT tests in most studies that had examined grades in specific college courses. Summarizing data from 19 subject areas, Cole found that student-reported grades predicted grades better in areas representing 304 specific courses, that ACT tests were better predictors in areas representing 69 courses, and that they were equal in areas representing 44 courses.

Maxey (1972) compared school-reported and student-reported high school grades as predictors of college academic achievement. In 26 colleges, Maxey found that school-reported grades had essentially the same predictive power as student-

reported grades. The median correlation between student-reported grades and college grades was .58; the median correlation between school-reported grades and college grades was also .58. In the 77 colleges that used high school rank as a predictor, student-reported grades were slightly better predictors of college grades. The median correlation between college grades and student-reported high school grades was .52; the median correlation of college grades and high school rank was .48.

In brief, there is considerable evidence that self-reported grades can be as useful as school-reported grades as predictors of college grades.

Self-predicted academic performance and self-concepts of academic ability

An additional class of variables that has recently been explored are self-made predictions of performance and self-concepts of academic ability. Brookover (1962), for example, has developed brief scales of general self-concept of academic ability (8 items), and similar scales of self-concepts of ability in the four areas of mathematics, English, social studies, and science. Typical items asked students were: where they thought they ranked in their classes, whether they thought they had the ability to be doctors, professors, etc. The scales showed adequate reliability. For seventh grade students, the general self-concept measure predicted overall grades with a correlation of .57 for both males and females; the correlations between IQ and grades were .61 for males and .65 for females. The self-concept significantly added to the multiple predictions of grades, however. The measures of self-concept in the specific areas were correlated more highly than IQ with grades in the subjects corresponding to the specific areas in two comparisons, were correlated as highly in two comparisons, and were correlated less in four comparisons. In every case, the multiple correlations using both specific area self-concept and IQ were substantially higher than either alone. In a second study, Brookover, *et al.*, (1965) found that when the scale was administered in the seventh, eighth, ninth, and tenth grades, it predicted grades one, two, and three years later with considerable efficiency, in most cases as well or better than IQ tests, but less well than earlier grades. More recently, Binder, Jones, and Strowig (1970) found that the Brookover scale was a better correlate of grades in twelfth grade than an IQ test and a self-expectation scale. In four samples the correlations were .56, .51, .71, and .67. The scale had substantially higher beta weights than the other measures in a multiple regression with grades, although the multiple correlation using all measures was higher than any zero-order correlations.

At the college level, Biggs, Roth, and Strong (1970) found that the Brookover scale predicted overall grades in college with reasonable efficiency. When compared to a multiple correlation based on standardized tests (including the Minnesota Scholastic Aptitude Test and the Academic Achievement Scale of the Strong Vocational Interest Blank), the multiple correlations of the Brookover scale and high school grades had about the same degree of accuracy for males but were less nearly accurate for females. Biggs and Tinsley (1970) used an adaptation of the Brookover scale to predict college grades in two different samples. In both samples the self-concept of ability was a better predictor than standardized college admissions tests (.54 versus .45 in one sample; .44 versus .30 in the other). When ability was partialed out, the correlation was still significant. Jones and Grieneeks (1970) found the Brookover scale to be a better predictor of college grades than the SAT (.48 versus .36 for women; .49 versus .22 for men) and had the highest beta weights in multiple regression equations. Sproull (1969) also found that the Brookover scale administered in high school predicted academic performance in college, full-time versus part-time status, and major area. Using a similar measure—

Peterson's motivation for grades scale—Furst (1966) found correlations of .47 and .53 (men and women) with high school grades, higher than those between verbal ability measures and grades. Lindsay and Althouse (1969) found that the same motivation-for-grades scale significantly increased the multiple correlation predicting college freshman grades, after SAT verbal, SAT math, and high school grades already had been included. The scale was the second best predictor, after SAT scores for females, and high school grades for males. A summary of validity studies using the motivation for grades scale in the ETS validity study service (Oppenheim, 1970) found that, in hundreds of studies, the average increase in multiple correlation was .03 *after* high school grades and SAT scores were already included. One might wonder how much grades and SAT scores would add to the scale if they were included in a stepwise multiple regression first.

Yet another approach was used by Keefer (1969) who simply asked students at the beginning of the college year and at the beginning of three other grading periods to predict their end-of-freshman-year grades. Self-predicted grades were consistently better predictors (the correlation was .51) than college entrance tests of academic ability (.41) and high school GPA (.43). The accuracy of predictions did not decline over the nine month period. In addition, the self-predicted grade consistently added to the multiple correlation, after aptitude and high school grades had been entered. In earlier studies, Doleys and Renzaglia (1963) found that self-predicted grades did predict grades, but with less efficiency than SCAT scores, and the self-predicted grades raised the multiple correlation only from .63 to .65. Freehill (1952) found that self-predicted grades predicted womens' grades in science better than ability tests. Although self-predicted grades added to the multiple correlation in science for women, and "verbal" courses for men, they did not do so in "verbal" courses for women, and science for men. Freehill points out that questions concerned with the student's perception of his relative standing in comparison with other students are more useful than direct predictions of grades. (The former is very much like the content of the Brookover and Peterson scales, and self-ratings.)

In another group of studies using college students, simple one-item self-ratings of academic ability or scholarship have been found to predict college grades better than academic ability measures or previous grades in large samples of National Merit Scholars (Nichols and Holland, 1963), college students representing a wide range of talent (Baird, 1969a), and able psychology graduate students (Wiggins, Blackburn, and Hackman, 1968). Holmes and Tyler (1968) found that a simple ranking of oneself in comparison with peers was a better predictor of college GPA than TAT scores, or laboratory tasks (in this study, the self-ranking was the only significant predictor). These simple self-ratings are very similar to the basic content of the Brookover and Peterson scales.

In summary, self-estimates of ability seem to be relatively efficient predictors of academic performance. However, the kind of self-estimate must be carefully defined. Apparently the most efficient format for self-estimates is to ask the subjects to estimate their relative standing in a group of their peers. Most students should be able to do this quite well after twelve years of comparisons with their peers, feedback on test scores, and the daily evidence of their performance in classwork and tests. Such experiences should provide students with a conception of their own capacities that incorporates ability, past achievement, and motivation. In any case, estimates of this type seem valid, and students appear able to estimate their own ability correctly.

Self-estimates of traits have proved to be very effective predictors in a wide variety of areas besides academic performance. For example, a number of studies at National Merit Corporation

(Holland, 1961; Holland and Astin, 1962; Nichols and Holland, 1963; Holland and Nichols, 1964) showed that simple self-ratings on four-point scales on a variety of traits were among the best predictors of later college accomplishment in such creative areas as art, science, leadership, music, dramatics, and writing. These studies indicated that such self-ratings were often better predictors than SAT scores, personality scales, interest scales, and measures of student potentials. These results were based on studies of extremely academically talented students. However, other studies (e.g., Baird, 1969a) have found that self-ratings continue to be very useful predictors of later accomplishment among diverse groups of students. Although the use of self-ratings may be questioned where students might believe that the ratings were being used for selection purposes, students may give more honest answers than one would expect.

Self-ratings are also highly related to vocational and curricular choices among college students (Abe and Holland, 1965a, 1965b; Holland, 1968). In these studies certain self-ratings distinguished among fields as well as interest test scales, and distinguished better than did many other variables.

Finally, a number of studies by the American Council on Education have used self-ratings as basic sources of data for a number of studies of the characteristics of students and the influence of colleges on students' educational and vocational plans (American Council on Education, 1966-1975; Astin and Panos, 1969).

All these results lend support to the idea of using self-ratings to assess academic and non-academic traits.

Prediction of grades by general biographical information

In addition to self-reported grades, self-concepts of ability and self-ratings, a variety of studies have found other, more general, biographical information to be related to grades. This research is more difficult to summarize since much of it has been on a purely pragmatic "Let's try it and see what happens" basis, as Freeberg (1967) has pointed out. In general, earlier studies found that multiple predictions based on academic aptitude measures and previous grades are improved slightly, but significantly by the addition of general biographical information (e.g., Myers, 1952; Myers and Schultz, 1950; Schultz and Green, 1953; Webb, 1960; Hilton and Myers, 1966). By contrast, recent studies have had more success in the use of biographical information, perhaps because of improvements suggested by earlier studies. For example, Denham (1966), using a combination of biographical data and self-ratings, was able to account for a larger percentage of variance in college grades than did SCAT scores. The combination also predicted number of hours completed, while SCAT scores did not. Lunneborg and Lunneborg (1966a) predicted college freshman grades in four areas, overall grades, withdrawal, and change of major from biographical information, high school grades, and ability test scores. Multiple regression equations were developed for each criteria. When just the first six predictors of the criteria in each equation were tabulated, only one high school grade was selected, along with five test scores, and twenty-two biographical variables. Only biographical variables predicted withdrawal and change of major. Nichols (1966) found that specially constructed "Objective Behavior Inventory" scales, which consisted of students' reports of their activities and preferences, predicted college grades almost as well as self-reported grades, and, for certain groups, a specially developed scale from the California Psychological Inventory. Starks (1967) successfully used biographical information, both alone and in combination with a reading test, to predict subject-matter learning.

Nichols and Holland (1963) found a wide variety of biographical variables predicted college grades in a sample of extremely bright students. In gen-

eral, these variables clustered around two traits that are mentioned frequently in studies of the non-intellective predictors of grades: (a) perseverance and motivation to achieve, and (b) conformity and socialization. Roberts (1965) found similar results in another sample of very bright students. He examined item correlations with college grades and creative achievement in science, writing, art, music, speech and leadership, and developed scales based on the most predictive items. The researcher summarized the content of the grades scale, ". . . as including obviously related academic accomplishments (such as the self-rating of academic ability)." In addition, ". . . it appears that college freshman 'A' students had fewer interests, were less active, less social and less competent in a number of practical, everyday affairs than were 'C' students. They did not have fewer accomplishments . . . but they did not have more. In short, some of the popular unfavorable stereotypes of high grade achievers are supported." In addition, the grade prediction scale had negative correlations with every other scale except the science scale. Nichols (1966) has summarized the content of another biographical scale for predicting grades: students scoring high more often endorsed items suggesting ". . . that they are religious and involved in church activities, they are interested in music and participate in musical activities; are hard workers with well established work habits; and are shy, socially withdrawn, and introverted." Other variables suggested that students obtaining high grades were more compulsive and conforming. (A review of the attempts to describe the relation of personality to academic success is beyond the scope of this monograph, but these descriptions are consistent with many studies; for example, Bendig, 1958; Bendig and Sprague, 1954; French, 1963, 1964; Gebhart and Hoyt, 1958; Gough, 1953; Holland, 1959, 1961.) To summarize, general biographical variables reflecting orderliness, compulsiveness, perseverance, introversion, conformity, and a high valuation of grades, seem to predict high grades.

Although general biographical information may predict grades in an absolute sense, and may add to the multiple correlation, biographical information may be particularly useful in two nontraditional ways: as moderators, and as variables in differential prediction. The general technique of moderator regression analysis is described in Section VI. It is based on the idea that a given variable may predict a criterion better for certain subgroups than for others. For example, the best predictor of grades for humanities majors may be the SAT-verbal scale, whereas for science majors the best predictor may be high school grades. In this case, the "moderator" would be major field. Many studies have reported results of this kind. Frederiksen and Melville (1954) for example, found that a scale of interest in engineering predicted engineering grades for "noncompulsive" students far better than it did for "compulsive" students. The measure of compulsiveness itself was not related to grades or the interest scale. The general strategy of moderator analysis is to find variables that will identify homogeneous groups of individuals for whom predictors work in different ways. These analyses should indicate which groups are predictable, and which variables are most predictive with which sorts of people. Studies demonstrating this kind of analysis include: Berdie, 1961; Frederiksen and Gilbert, 1960; Ghiselli, 1960a, 1960b, 1963; Rock, 1965; Saunders, 1956; Stricker, 1966. However, as Klein, Rock and Evans (1968) pointed out, most of these studies have focused on only one variable at a time. Their study illustrates a method for examining several possible moderators at the same time. For example, the least predictable group of the law students they studied consisted of students of low socioeconomic status, who tended to be older. They conclude, ". . . the value of background variables may lie in their effectiveness as moderators rather than in their utility as predictors." This approach, using biographical information as

moderators, has been used to identify over- and under-achievers and students with creative accomplishment in various areas. These areas will be discussed at greater length later on.

Horst (1954, 1955) has developed a system of differential prediction that is analogous to the moderator system just discussed, but focuses on the criteria, choosing predictors that best account for differences among criteria. For example, if grades in six areas are predicted, differential prediction selects the first predictor that has the highest average correlation with the differences between all possible pairs of criteria; that is, differential prediction identifies the variables that predict the differences in grade performance in science, humanities, social science, and so on. The predictors subsequently selected are those which, combined with earlier selections, produce the highest average multiple correlation with these criteria of difference. Horst (1954) has developed an index of differential prediction efficiency. The technique is discussed in Section III. Differential prediction is particularly useful for placement decisions; for example, those made by students and counselors who are deciding among various majors and courses. Differential prediction could help students decide which major to enter by identifying the curriculums in which they would do best. Thus, differential prediction was not developed to identify the predictors that predict overall absolute academic success, but was designed to identify the predictors of relative success. The Lunneborgs have found that biographical variables are highly useful as predictors of differential success in a number of studies (Lunneborg, 1966, 1968; Lunneborg and Lunneborg, 1966a, 1966b, 1969). Lunneborg made a convincing case for biographical information in differential prediction in 1968:

"These findings suggest that indeed biographic data are more important in making differential predictions of academic achievement than in making absolute predictions. The latter relied much more heavily on measures of prior academic achievement. That is, while biographic information is not predictive of what is common to success across course areas, it is essential to explain why a student may succeed in one area and fail in another, or if he is likely to succeed in all areas, why achievement could be greater in one area than another. Where predictions are used by the individual the variability inherent in biographic data permits better choices among competing criterion activities.

"For example, suppose there are some aspects to family life, attitudes, interests, or ways of thinking that are characteristic of students who do well in mathematics and not characteristic of students who do well in biology. With predictions based on this background information a student can choose between the two fields. On the other hand, if his predictions of success in the two fields are based on the characteristics common to those students who succeed in mathematics and those students who succeed in biology, then choice is impossible. He will be informed that he will either succeed in both areas or fail in both.

"Differential prediction obviously demands that there are actual differences among criteria. Assuming, as in this study, that such differences exist, the relatively low correlations obtained with the criteria have one source—lack of matching variability in the predictors. A search for a more complex, factorially discrete set of predictors must necessarily accompany adoption of the differential model, for only in this way can the multiple correlations with the criteria be raised. In the meantime, the accuracy of the absolute model is sacrificed for the greater utility of differential prediction to personal decision making." (p. 106)

Practical implications

This review of biographical information and grades has examined research accumulated over many years, using various methods, in varied samples such as grade school students, high school

students, college applicants, junior college students, four-year college students, and professional and graduate school students. It leads one to conclude that students' reports of their grades are as reliable and valid as school-reported grades. This conclusion seems particularly valid when one considers the conditions involved in some of the studies. That is, even when students were faced with the pressures of maintaining scholarships (the National Merit studies), applying to college (Davidsen; Holland and Richards; Hoyt; Maxey and Ormsby; Boldt; Armstrong and Jensen), and deliberate experimental attempts to get them to change their responses (the Walsh studies), they continued to tell the truth. But what about the problems of actual, pragmatic usage of self-reported grades and other biographical information about college applicants? There are three sorts of problems, the first concerning the technical usage of the information, the second concerning implications for policy, and the third concerning ethical problems.

The evidence concerning the technical issues indicates that self-reports of grades can usually be believed, even when the student knows that his self-reported grades will be used as one of the selection criteria. Self-reported grades can be gathered in routine admissions procedures, and used in many selection and guidance decisions. But even if the overwhelming majority of students are honest, some may not be, and it is these students who are of concern to many colleges. What could be done to reduce their inaccurate grade reporting? The first task would seem to be to reduce some of the ambiguities in the present systems of collecting self-reported grades. The comments and recommendations of Maxey and Ormsby and Armstrong and Jensen would be good starting points. Another way to decrease the rate of distortion would be to imply that the students' actual grades may be looked up, and to use spot checks as a further precaution, as suggested earlier. The Kirk and Sereda (1969) study leads one to expect that further research could find a pattern of variables on standard admissions forms, such as the College Board's Student Descriptive Questionnaire (SDQ), that would lead to identification of the student who is likely to exaggerate his grades. Such a pattern would be roughly analogous to the "lie" scales on personality and interest tests. Then the college could check the grades of students who scored high on the scale. However, the main point should be remembered: most students tell the truth. In short, it seems that self-reported grades can be legitimately used for most of the purposes for which school- or college-reported grades can be used, at considerably less cost and with fewer administrative problems. For example, self-reported grades reported on a standardized format such as the SDQ could be used in an information system that would: routinely report to participating colleges on the characteristics of their applicants; provide students an estimate of the grades they would obtain in specified colleges, based on recent grade prediction studies; report to colleges the characteristics of the enrolled freshman class; and report the information on the students' choices and prospects to high school counselors. A system like this, developed by the American College Testing Program, has been widely used by hundreds of colleges, thousands of high schools, and millions of students for more than a decade. Supporting materials provide potentially very useful guidance guidelines for high school counselors and students.

The second class of problems is much more difficult and puzzling. These problems stem from the fact that certain biographical information may add to the prediction of grades at a statistically significant level, but produces dilemmas for the user. For example, there is ample evidence that the grades of women are more predictable and tend to be higher than those of academically equally able men (e.g., Abelson, 1952; Baird, 1969b; Jacobs, 1959; Munday, 1967; Seashore,

1962). But this result is difficult to use. Should a college deliberately admit more women because they can be more reliably expected to earn higher grades? Should it ignore the difference, and put everyone into one regression equation, and thereby overpredict for men and underpredict for women? Would this represent favoritism toward men and bias against women? Should the college recognize the difference and include different admission criteria for men and women? Would a quota for each sex then need to be used? Would the introduction of different admission criteria outrage academic sensibilities? What would be the reaction of various external groups and publics if one course or the other were followed? Similar problems arise if a different level of grade performance, or a different level of predictability is found for students of different ethnic or racial background, social class, type of high school, and so on. (Of course, the kinds of problems discussed here are similar to the problems connected with the use of personality or interest tests.) The basic question is to what extent these kinds of variables should be used for admissions decisions. The position taken here is that most variables of this type should not be used as part of the admissions decision except, rarely, in marginal cases. Much biographical information is concerned with things over which the individual has no control—and cannot change—sex, race, social background, family education, etc. It does not seem reasonable to hold such things against a candidate (nor to hold them in his or her favor) since they are almost accidental phenomena. However, it may be appropriate to use some biographical information of certain types in marginal cases. The type of information might include such details as study skills, value placed on education, etc. These variables could be used in a two-stage strategy. In the first stage, the usual academic measures could be used to admit students with given chances of success until a predetermined level of probability of success was reached. The rest of the applicants could be examined using the biographical data as supplementary information.

Another approach to the problems of using biographical information would be to use the results of existing research studies as a base for further research to determine the underlying traits that explain why students in one group do better, or are more predictable, than students in other groups. For example, the greater predictability of women, compared to men, may be due to greater ability to concentrate, better study habits, etc. These traits could be identified by research and measured by new assessment procedures. Such underlying traits could be used to select students in ways that seem fairer and more legitimate than ways that rely on group differences in predictability.[1] Some useful ideas for possible research are already available in the voluminous research about the background, demographic, personality, and other characteristics related to grades.

A third class of problems concerns the ethical issues involved in asking for sensitive personal information and in using that information. The recent EEOC guidelines highlight the concern felt by many that information about their backgrounds will be misused. This concern is warranted because, unfortunately, information about individuals' backgrounds have been misused for capricious or prejudiced reasons in a wide variety of educational and vocational situations. Even when there is a rational basis for considering group differences in achievement and predictability, as in the example of men and women just discussed, the ethical problems of holding something against people who have no control over their past remain. Just as with the use of personality or interest tests for admissions purposes, each self-report variable that is proposed for use in an assessment device needs to be carefully examined

1. This idea was suggested by Robert Boldt (personal communication).

for all its ethical implications. Even fairly innocuous information can be used in very unfair and objectionable ways. These considerations also suggest that each person who completes a questionnaire should be told the reasons he or she is being asked for the information requested.

Section II: Biographical and self-report information in the sequence of higher education

Biographical information and other brief self-report measures have been related to all aspects of higher education, including college attendance, choosing and attending a college, choosing a living group, choosing a major, general adjustment to college, and withdrawal from college. This section reviews studies bearing on these areas.

College attendance

College attendance is related to a great variety of things (e.g., Beezer and Hjelm, 1961; Berdie and Hood, 1965; Wilson, 1966). However, most of the research on college attendance has been concerned with two determinants: intelligence and social class. The higher the student stands on either of these variables, the more likely is he or she to attend college. Studies using both variables have produced different, but complementary results. Some studies have found that intelligence is a more important influence than socioeconomic status (Schoenfeldt, 1966, 1968; Nam and Coward, 1962). Other studies have found that socioeconomic status (SES) is a better predictor than intelligence (Kahl, 1953; Medsker and Trent, 1965; Rogoff, 1963; White, 1952). Some other studies have found SES and intelligence to be approximately equal in influence, or to have different patterns for males and females (Educational Testing Service, 1957; McGuire, 1967; Sewell and Shah, 1967, 1968; Prediger, 1969). A number of other studies have found that parental encouragement was positively related to educational achievement above and beyond SES and intelligence (Bordua, 1960; Rehberg and Westby, 1967; Sewell and Shah, 1968; Simpson, 1962). Of course, these variables are interconnected with the parents' ability and willingness to contribute to financial support for college costs.

The studies just mentioned need to be studied carefully, since many investigations indicate that general "socioeconomic status" is an abstraction that reflects many different, if connected, variables. These include heredity, the physical surroundings and facilities available, diet, health care, language patterns, the neighborhood and school setting, the family's provision of educational experiences, the family's ability to finance education, parental aspirations, and child rearing practices. Each of these areas has been the subject of study and research. For example, the effects of child rearing practices on achievement behavior have been examined by Goode (1964), Rosen (1964), Morrow and Wilson (1961), Douvan and Adelson (1966), Elder (1963), and Rehberg, Sinclair, and Schaefer (1970). These studies generally support the idea that child rearing practices are related to achievement behavior, but as Rehberg, et al., conclude, the size of the ". . . degree of association have led us to believe that there is

more interfamilial variance in achievement behavior unaccounted for than accounted for." This conclusion probably applies to each of the components of "socioeconomic status." Although the relative importance of these variables is still a matter of professional controversy among sociologists (see the continuing discussion of the Jencks et al., book *Inequality*) it is clear that they are important determinants of students' aspirations and achievements. The importance of these variables leads to several pragmatic possibilities. The influence of SES on educational aspirations and achievement suggests that special recruitment of bright students from low SES backgrounds may be necessary. The importance of parental encouragement may entail counseling or educational programs involving parents as well as students. And, of course, financial aid policies are related to parental willingness to contribute.

Recent evidence suggests that the context of the local high school also influences student aspirations and achievement (Wilson, 1959; Michael, 1961; Turner, 1964; Campbell and Alexander, 1965; Boyle, 1966; Sewell and Armer, 1966; McDill, Rigsby, and Myers, 1969; Meyer, 1970; Hauser, 1970). As Bain and Anderson's recent (1974) review of these studies indicates, the high school context is probably less powerful than other variables related to the family. However, its influence suggests that schools with many low SES students may need to make special efforts to encourage able students to attend college. These studies have shown that students who are enrolled in high schools with a high proportion of students from high socioeconomic backgrounds are more likely to attend college than equally able students in schools with a low proportion. However, Meyer (1970) has pointed out that this positive effect masks a negative one. Since high status schools often have more able students, the able students' aspirations are lowered, presumably because of the higher level of competition. Alexander and Eckland (1974) tried to analyze the mechanisms through which this effect works. They also found that the higher the ability composition of the school the more depressed were the students' educational plans, and the higher the social status composition of the school, the higher the students' plans. They found that the depressive effect of some schools on their students' plans were mainly the result of the lower class rank that students in a high ability school had, and the enhancing effect of social class composition resulted from the likelihood that the student would enroll in a college preparatory curriculum and associate with college oriented peers in the high status schools.

One of the largest data files accumulated in the history of educational research, Project TALENT, has been analyzed by Folger, Astin, and Bayer (1970). Using a subsample of this vast source of information, the authors studied 8,746 males and 6,794 females who had completed the TALENT battery of tests and questionnaires as high school seniors, and who had responded to a five-year follow-up survey (Flanagan and Cooley, 1966). The researchers used several criteria that will be examined because they are germane to the topics reviewed here. The first criterion was college attendance or nonattendance. The researchers presented zero-order correlations of 38 variables with the criterion, partial correlations of each variable with the criterion with the effect of the remaining 37 variables partialed out, partial correlations of each variable with the criterion with all the other variables not in the same domain (such as ability scores, temperament measures, etc.), multiple correlations of all the variables in a specified domain with the criterion, and multiple-partial correlation of all variables in the domain with the criterion, partialing out the effect of all other variables. Obviously this variety of analyses provides a number of ways to study the phenomena of college attendance. Whichever system was used, however, seniors' plans to attend college and mathematical aptitude test scores predicted college attendance best. The three domains most

strongly related to college attendance were, in decreasing order, college commitment variables (including college plans, encouragement of college plans by the student's parents and peers), ability variables (vocabulary, general information, creativity, abstract reasoning, and mathematical aptitude scores), and socioeconomic variables (family income, father's occupation, father's education, mother's education, and number of books in the home). Domains related to a lesser extent were (in descending order): interest variables, variables describing the high school the student attended, the student's marital and parental status, the student's family condition, residence variables, temperament variables, and ethnic and religious status. These results indicate that relatively simple direct measures of students' backgrounds and experiences clearly contribute to the prediction of college attendance.

As the Folger, Astin, and Bayer study indicated, a variety of biographical variables influence college attendance such as the urban or rural setting of the home (Sewell, 1964), high school size (Coffelt and Hobbs, 1964; Simmons, 1963; Stroup and Andrew, 1959), size of family (Educational Testing Service, 1957; Medsker and Trent, 1965; Simmons, 1963) and religion (Bordua, 1960; Medsker and Trent, 1965; Trent, 1965; Trent and Medsker, 1968). Race, of course, is also related to college attendance. Each of these differences suggests new recruitment strategies, counseling practices, and educational programs. Also, taken together, these variables suggest that perhaps researchers should focus their energies not only on understanding and measuring the impact of the variables on aspirations and achievement, but should also attempt to develop techniques to modify the sometimes deleterious influence of these variables.

The influence of biographical factors on college selection

Many factors are involved in the choice of a college: students' characteristics, their families' characteristics, their peer group relations, the social and economic context, the information available to them, and the characteristics of the college. For example, there is evidence that students of higher SES are more likely to emphasize the prestige, intellectuality, and social character of the college in their choice than do low SES students (Baird, 1969a; Rossi and Coleman, 1964).

The most striking result in studies of college choice is the lack of information that characterizes most student choices (Holland, 1959; Rossi and Coleman, 1964; Trent, 1965). As Holland (1959) puts it, students generally ". . . make choices in the same way that consumers often, if not usually, buy household goods; they select colleges by means of vague notions which they seldom can document meaningfully."[1]

Regardless of student ignorance, a vast literature indicates that, consciously or not, by their own selection or the colleges', students with different backgrounds and traits enter different kinds of colleges (e.g., Astin, 1965b; Baird and Holland, 1969; Astin, Panos, and Creager, 1967; Hood and Swanson, 1965; Medsker and Trent, 1965; Schoenfeldt, 1966, 1968; Rossi and Coleman, 1964). Many of these studies indicate that students from high SES backgrounds are more likely to enter prestigious and selective institutions, and less likely to enter such less prestigious institutions as junior colleges.

A study by Hoyt (1968) indicated that a number of "biographical" items were related to the characteristics of the 169 colleges chosen by students.

1. Here is an area where "biographical" instruments could be of great use by assessing the degree of knowledge that students have about colleges. Those students found to have little realistic knowledge could be directed to college guides, general descriptions and to other materials that would help them to make a more informed choice.

The biographical items included a checklist of educational goals (Baird, 1967b), level of educational aspiration, part-time work expectations, college attractions, influence of parents and peers, and nonacademic (creative) accomplishments. The percentage or means of entering freshmen classes on these variables were correlated with the Astin (1965a) scores of college environments. In 18 of 19 cases a multiple R of student characteristics significantly correlated with college characteristics. In a similar study, Astin (1968a) also found that average student characteristics were correlated with the environment scores of 246 colleges. Excluding two physical factors—spread of campus and friendliness of the dorm counselor—measures of student characteristics from a biographical questionnaire had correlations of .50 or higher with 27 of 33 remaining environmental dimensions. The median highest correlation was .63, the median second highest correlation was .58. Eight of the correlations were above .72. In an earlier study, Astin (1965a) developed other environmental measures, and related derived measures of student "input" characteristics to them. These correlations were also approximately in the range just cited.

Pace (1969) has also reported correlations between student characteristics and the dimensions of environment in his *College and University Environment Scales*. For example, the "Practicality" of the colleges correlated −.74 with the mean SAT scores of entering students, −.52 with majoring in the humanities, and −.63 with self-ratings of unconventionality. "Community" correlated −.52 with the pragmatism of freshmen (Astin's input score), and −.62 with having no extracurricular activities. "Awareness" correlated .53 with status of freshmen, .47 with majoring in the humanities, and .42 with lack of a religious preference. "Propriety" correlated .57 with the proportion of males in the college, .48 with planning a career in education, and .55 with attending church regularly. "Scholarship" was correlated .60 with the mean SAT of students, and .60 with the intellectuality of the students. Folger, Astin and Bayer (1970) also reported a wide variety of background correlates of attendance at nonselective or selective senior colleges.

These results suggest that the students "select" colleges with characteristics roughly congruent with their own; it also suggests that colleges "select" students with particular characteristics. Perhaps a better description of this process would be the "flow and distribution of students to institutions" which is not a random process. There are several significant implications. First, it may be possible to make the choice of college more rational by providing information about the choice process, and about colleges that the student might not otherwise consider. Second, colleges might seek to enroll a greater diversity of students. This might be done through a student locater service, for example, the College Board's Student Search Service. Third, these results add support to the tentative conclusions of earlier researchers (e.g., Darley, 1956) that "the students make the college." That is, a great many of the significant aspects of the college environment are determined by the characteristics of the students attending them. While the evidence for this conclusion is too complex and voluminous to review here, its ramifications can be outlined. A college could profitably examine the characteristics of its incoming classes. By including a wide variety of biographical data (and by referring to appropriate research) colleges could obtain useful descriptions of the needs of their students, and gain some idea of the environments they will help create. If colleges wish to change their environment, probably the simplest and most effective way to do so is to recruit and select new students with different characteristics.

Biographical factors in choosing a residence

Students who choose various kinds of residences clearly differ in socioeconomic status (Baird,

1969b; Dollar, 1966; Jackson and Winkler, 1964; Kaludis and Zatkin, 1966; Levine and Sussman, 1960; Scott, 1965). Students entering fraternities or sororities generally come from higher SES homes than do students who enter other kinds of residences or who live at home. In addition, those who enter fraternities and sororities generally participated in more extracurricular activities in high school (Baird, 1969b) and describe themselves as being oriented toward social activity (e.g., Scott, 1965; Stark, 1965; Baird, 1969b).

Johnson (1970) and Miller (1973) compared fraternity members and independents on the scales of the College Student Questionnaire (Peterson, 1965). Both investigators found that fraternity members had lower scores on measures of independence of peers and of liberalness. Miller found that fraternity members scored lower on the scales of cultural sophistication and higher on family social status. Both investigators found the groups were equal on motivation for grades, independence from family, and social conscience. (Reviews of the many studies of residence groups are provided by Feldman and Newcomb, 1969, and Longino and Kart, 1973, to which the reader is referred.)

Research using biographical and other brief self-report information indicates that fraternity and sorority members, in comparison with those in other residence groupings, tend to come from higher economic backgrounds, to be more socially oriented, to plan to be active in campus affairs, and to be more socially assertive. These differences are largely the result of self-selection and selection by the groups (Michigan Student Survey, 1967a, 1967b). Feldman and Newcomb's, and Longino and Kart's reviews suggest that college residence also influences withdrawal rates, and changes in attitudes and values. Most researchers agree that the peer-group influence is probably the most important factor in the educational growth of students (Newcomb and Wilson, 1966), especially when the groups are small, and where the members can relate frequently and intimately with one another. These differences should not be exaggerated, however; most differences are small, and there are no differences on many variables.

These results are interesting and plausible. However, college administrators and others who work with students may well wonder how they could use such information. It is particularly important to know how information of this type could be used to make residence groups more effective agencies of educational and psychological growth. Biographical information could help administrators and student personnel workers understand the backgrounds, aspirations, and expectations of students in various kinds of residences. But a potentially more important use of biographical information is as a basis for experimental manipulation of the composition and group dynamics of residence groups. A handful of studies have attempted such manipulation. Brown (1968) found experimental effects on students' choice of major, friendship patterns, and satisfaction. Morishima (1966) found experimental residence effects on attitudes and "scholarly orientation." Beal and Williams (1968) produced effects on student satisfaction by changing the pattern of residential grouping. These studies need to be replicated and extended, of course. But they are suggestive of the kinds of possible actions that could be taken to increase the educational and adjustment outcomes of students.

Biographical factors in choosing a major and in vocational choice

The choice of a major field may be an even more complex process (but perhaps more understandable) than the choice of college (Crites, 1970; Holland, 1973; Osipow, 1973; Super & Crites, 1962). (The biographical correlates of choosing particular career fields are reviewed in section V. Much of the evidence in that section applies to the choice of major.) Again, SES is related to the

choice of majors. High SES students tend to "overchoose" arts and humanities, social science, prelaw and political science, and premedicine. (Studies of law students [Warkov and Zelan, 1965; Baird, 1974] and medical students [Rogoff, 1957; Baird, 1974] indicate that these professions draw heavily from the upper and middle classes.) Low SES students tend to "overchoose" education, engineering, and certain sciences (Davis, 1965b; Baird, Clark, and Hartnett, 1973).

Students in different fields also vary on many other "biographical" variables—self-ratings (Abe and Holland, 1965; Holland, 1968), life goals (Abe and Holland, 1965; Holland, 1968), and values sought from jobs (Davis, 1965; Slocum, 1974; Thistlethwaite, 1963). The largest studies of this type are Davis' *Undergraduate Career Decisions* (1965b) and *Great Aspirations* (1965a), Astin and Panos' *Educational and Vocational Development of College Students* (1969), and Baird's *Careers and Curricula* (1974). Davis' study was concerned with the changes in students' career choices during their undergraduate years. The biographical variables associated with original choice, retention of choice, and recruitment to choice in nine general occupational groups were studied. The groups included: education, business, humanities, other professions, law, physical science, medicine, and engineering. The associations in these analyses were generally moderate but typically are as high as those reported in similar analyses conducted with personality and other test scales. Davis summarized his results for each field. In some cases the summaries required a number of qualifications, as when a general trend did not hold for a particular subgroup. As examples of his results, his summaries for business and the physical sciences can be outlined. Business is a masculine field among freshmen and tends to recruit proportionally more men during the course of college. Students choosing business placed more emphasis on the values of "making a lot of money," and less on "opportunities to be original and creative." Students choosing business had lower academic performances. Catholics are relatively more attracted to business, and blacks less attracted. Interest in people, SES, and hometown were not strongly related to the choice of business. The choice of physical science was negatively related to interest in working with people. The choice of the physical sciences was associated with the occupational value of originality among men and with "making money" among women. Students choosing the physical sciences were more often high academic performers. SES was unrelated to freshman choice of physical science, but low status students, particularly those with appropriate values, were more likely to remain in science and to shift into it during college.

Davis (pp. 75-76) summarizes the major pattern of findings for the correlates of change:

- In general, the items that discriminate between defectors and those remaining in a field are the same as those distinguishing between recruits and nonrecruits. Thus, the same sorts of characteristics are related to remaining in a given field and shifting into it from a different freshman choice.
- In general, the items related to choice during college are the same items that associated with freshman choice. Thus, differentiation during college tends to continue directions of selection already begun at entry into college.
- The social sciences constitute an exception to these generalizations, the suggestion being that college experience leads to a shift in the sort of student attracted to these fields.

Davis' conclusions suggest that undermanned fields could recruit students from groups of students with particular characteristics.

In contrast to Davis and to Baird, Astin and Panos (1969) had actual data on students' characteristics when they were freshmen rather than retrospective accounts. Astin and Panos found that freshman career choice was generally the best predictor of final career choice when stu-

dents were followed up when they were seniors. Major field added to the prediction in most cases. Other variables, such as sex, highest degree sought, parents' income, and high school grades, also added to the multiple regression equations. (Astin and Panos found that income was related to career or final major field, whereas parental education was not.) They concluded:

"By far the best predictors of the student's final major field and career choice were his initial choices as reported four years earlier at the time of matriculation. The characteristic having the next greatest predictive value over the four-year interval was the student's sex. The trend toward greater differentiation of sex roles during the undergraduate years was pronounced, with men gravitating toward the more 'masculine' careers (i.e., those that were initially preferred more by men than by women) and women gravitating toward the more 'feminine' careers. The same was true for major field.

". . . In general, the student's career choice tended to move into closer conformity with the more popular choices among his fellow students. This effect was particularly evident in the case of the fields of engineering, teaching, law, and business." (Astin and Panos, 1969, p. 132)

In contrast to Davis and to Astin and Panos, Baird (1974) examined the relation between biographical and other simple self-report information about students when they were seniors and their actual educational activities a year later. The research was specifically designed to gain detailed information about the factors that determine who goes where to graduate and professional school.

The data for this study came from a followup of a national survey of a sample of college seniors who replied to a questionnaire, The College Senior Survey, in the spring of 1971 (Baird, Clark, and Hartnett, 1973). Some 7,734 people who had been seniors in 94 colleges across the country replied to a followup questionnaire designed to determine their activities a year after college. Analyses indicated that the sample included proportionately slightly fewer minority students than did the nonrespondents, but the sample did not seem to be biased in any other way, and included an extremely wide variety of students.

The College Senior Survey included a great deal of self-reported biographical, personal, attitudinal and educational information about students. Reports of their GRE, LSAT and MCAT scores were also obtained.

The followup questionnaire ascertained students' educational and vocational activities. The criteria used were working full-time; pursuing graduate study in the arts or humanities; pursuing graduate study in the social sciences; pursuing graduate study in the biological and physical sciences; attending medical school; and attending law school.

Baird studied the multiple regression results when postcollege activities were used as criteria and the senior survey data were used as predictors. These analyses were made twice, first without including senior plans for the activity, and then including them. This was done because plans correlated so highly with activity. Baird's results for each activity are summarized below.

Working full time. The results for working ($R = .56$ with plans, .40 without) indicate the various reasons for working: poor grades, poor test performance, late consideration of advanced study, parents' education and influence, being married, and low self-conceptions of ability. Women were more likely to be working rather than attending graduate or professional school, although they had better grades than men, on the average. The variables suggested a life history of lack of parental and peer encouragement of educational aspirations either because of the student's sex, peers, or background, associated with poorer academic performance.

Graduate work in the arts or humanities. The zero-order correlates of graduate work in the arts or humanities present a familiar picture of stu-

dents who rate themselves high in relevant abilities (creativity, artistic and writing ability) and low in science-related abilities, who have been rewarded for their work by faculty encouragement or grades, and who began college with a career in arts or humanities in mind. The multiple regression results for graduate work in the humanities (R = .50 with plans, .38 without) indicate the relevance of high verbal ability, grades, and a rejection of income as a basis for vocational choice.

Graduate work in biological or physical science. The correlational results (R = .68 with plans, .53 without) presented a picture of the future science graduate student as a student high in mathematical ability who wishes to contribute to knowledge, who is not particularly interested in people, and who gained the attention, encouragement and employment of the science faculty.

The correlates of graduate study in the social sciences (R = .52 with plans, .33 without) indicated that the future social science graduate students planned an advanced degree, and were confident of their academic abilities. They also tended to have planned a career in social science as college freshmen.

The correlates of studying law (R = .81 with plans, .49 without) indicated that prospective law students tended to be bright males who came from families who encouraged advanced education. They considered advanced training relatively early, entered college with law in mind, but were not encouraged to seek further training by their colleges' faculty. They tended to have confidence in their ability and tended to voice an interest in status, prestige, and income as reasons for their choice of profession.

The results (R = .84 with plans, .65 without) suggested that the most salient correlates of going to medical school were an early initial choice of medicine, greater concern for service than money, and high test scores.

The results of this study are consistent with earlier studies of students' career plans (Baird, 1973; Astin and Panos, 1969; and Davis, 1965) suggesting the importance of early consideration and interest in a field, self-confidence in one's relevant abilities, high test scores, and academic success. The results have a number of implications for theories of vocational choice and for practical policies, such as encouraging certain groups to consider advanced study, encouraging early consideration of a variety of careers, and counseling intervention to encourage proper curricular choices by students.

These studies indicate that many students' career choices change during college, but most students who do change move to similar fields, such as from physics to chemistry. Simplified, and generalized, and ignoring many complications, this process suggests that whether a student remains in a field or changes to a new one usually seems to depend on the congruency of the demands and characteristics of the field with his needs and characteristics. If the student's present field is the more congruent, the student will remain in it; if another field is more congruent, the student will move to it.

Students' views of their own talents seem to be highly related to the decision process (Holland, 1973, has summarized some of the evidence). In each of these areas, students seem to seek the careers most in line with their characteristics.

All of this makes the process of choosing a career field sound incredibly rational. In fact, choices are often made subconsciously, or as a consequence of chance encounters, course schedule changes, etc. The results just described are general ones, applying to large groups of students. Many people, quite happy in their current careers, would have difficulty giving a coherent, not to mention rational, account of how they chose it. However, even if a particular individual's choices may be hard to explain (Holland, 1973), there is a great deal of rationality in the process of changes of groups of students. Obviously, the chances

that a student would choose an appropriate career would be increased if the choice were made rationally. Unfortunately, such rationality requires so much knowledge about people, careers, their interaction and the future, that only the broadest sort of guidance can be provided at this time.

Biographical information as a predictor of attrition in college

The problem of school dropouts has been a concern to educators for nearly a century. Since Sputnik, of course, there has been great concern about the "loss of talent." Many people believe that one of society's goals should be to provide opportunities for everyone to pursue his or her educational goals to the fullest. The magnitude of this concern has led to the development of a voluminous literature. One review of research literature on dropouts found some 800 references published before June 1956 (Blough, 1956). A more recent review of studies of school dropouts (Varner, 1967) referred to 149 studies or summaries. Most of these were dated in the 1960's. The literature concentrating on college students is not quite as vast, but it is still large (see the reviews by Eckland 1964; Iffert, 1957; Iffert and Clarke, 1965; Spady, 1970; Summerskill, 1962; Tinto, 1975).

In general, attrition during college is related to both previous academic success and academic ability as well as socioeconomic status, and also to other variables. However, the relative importance of these variables in various studies is difficult to assess because of problems of sampling, equating, and the range of student input on the variables. Research is also complicated by varying definitions of dropping out or attrition (Eckland, 1964) and by the multiplicity of factors involved in leaving college (Sexton, 1965). In the studies that have included both ability and SES, there have been mixed results. However, it is clear that SES continues to influence students' educational accomplishment.

A second kind of biographical variable related to attrition in college is the students' desire for the degree and interest in college work. For example, Trent and Medsker (1968) found that the single variable most predictive of dropping out of college (to judge from the size of the X^2 figures) was a simple question about the students' feelings about the importance of college.

Bayer (1968), using a sample of 8,567 participants in Project TALENT, studied the relation of thirty-eight psychological and demographic variables to educational outcomes. For men, dropping out versus completing college was most strongly associated with ability variables, and then by family of procreation variables (e.g., age at which the student planned to be married); for females, the strongest associations were family of procreation variables, and then ability variables. For both sexes, socioeconomic status had slightly lower associations with dropping out. A similar pattern of results held for the criterion of delayed completion of college versus completion in five years, except that college commitment (plans for college, college plans encouraged by parents and peers) was the best predictor for women, and the second best predictor for men.

The Folger, Astin and Bayer study (1970), described earlier in the section on college attendance, also examined the variables associated with dropping out or completing senior college. Ability variables were most strongly associated with completion of college, followed by the students' marital and parental status, interest variables, temperament variables, parents' socioeconomic status, college commitment variables, and ethnic and religious background variables.

Among the very bright students followed by the National Merit Scholarship Corporation, Astin (1964) found that Merit finalists who drop out of college tended to come from lower SES backgrounds, to have lower ranks in high school, to plan initially to get lower college degrees, and to apply for fewer scholarships. (Personality test dif-

ferences were also found.) Watley (1968) found that, for his sample of Merit Scholars, initial educational aspirations assessed in 1957 were generally related to educational attainment in 1964—e.g., among the men who eventually obtained a doctorate or professional degree, 100 percent had indicated that they planned such a degree seven years earlier. However, the accuracy was not high —42 percent of men without any degree had also said they planned a doctorate. Fairly sizable differences between the students who had obtained a degree and those who had not were found in family background variables, and in students' self-ratings on drive to achieve, perseverance, concern with scholarship, expressiveness, emotional stability, and self-understanding. Differences on the California Psychological Inventory were also found. Recent studies by Chase (1968) as well as by Rossman and Kirk (1970) have also shown withdrawal to be related to a wide variety of biographical variables.

In the largest national study of attrition ever conducted, Astin (1972) examined various criteria of attrition in college. Studying a sample of 45,432 students enrolled in 194 four-year colleges, Astin used information about the students gathered when they were freshmen to predict attrition over four years. Using the criteria of either "obtained the bachelor's degree or still enrolled," Astin found that self-reported high school grade point average was the single best predictor of persistence followed by academic test scores, sex (male), students' assignment of low probability to being married in college, being a nonsmoker, and not being employed during college. Of course, the reverse of these variables predicted dropping out. Astin found similar results in analyses of attrition in two-year colleges; he also found similar results when he used other criteria of attrition.

When reviewing these studies, it is well to remember that some theoretical explanations are needed to account for dropout, as Spady (1970) and Tinto (1975) have emphasized. For example, Spady has noted that studies of the relation of attitudes to attrition need to be examined carefully.

". . . when socioeconomic and attitudinal factors are considered simultaneously, the advantages thought to accrue to individuals with particular kinds of attitudes do not exist independently of their family background. It is background experiences, then, that both lead to and account for the attitudinal differences often associated with attrition." (Spady, 1970, pp. 69-70)

He then notes the interaction of the background and dispositions that students bring to college with the characteristics of the college and with specific college experiences.

"The major inference to be drawn from this entire set of findings would appear to be that survival in college is dependent largely on a clear and realistic set of goals and having interests that are compatible with the influences and expectations of departmental faculty and curricula. Men in particular, however, appear to maintain high expectations despite the academic realities of college life. . . .

"In the main, then, the findings discussed here suggest that interpersonal relationships facilitate greater integration of the student into the social system of the college. To the extent that peer group norms either emphasize or denigrate academic endeavor, they may also influence achievement within the academic system, but this influence is more often implied in theory than verified empirically." (Spady, 1970, p. 72; p. 77)

Spady then goes on to develop a theoretical model of dropping out, which he tested in a later study (Spady, 1971). This kind of theoretical work seems a necessary step in furthering our knowledge about dropping out, and the role played by background variables. Further empirical work may add to our stack of materials on dropping out, but some conceptual guides through the maze of results is needed.

In summary, attrition in college is the result of

social, college-environmental, and personal variables, as well as things that are unique to each person who withdraws from college. However, the most important personal variables seem to be academic achievement, family background, motivational importance of the degree, aspirations, and self-concept. Self-report questionnaires seem to be a useful device for assessing many of these variables.

Biographical information may help to identify the potential dropout, but can it aid in attempts to keep the potential dropout from becoming an actual dropout? One contribution that biographical information can make is to diagnose the particular reason for possibly dropping out. For example, different approaches might be taken depending on whether the primary reason for possibly dropping out was financial, poor study skills, family conflicts, lack of peer group support, choice of an inappropriate major, or choice of an inappropriate college (Knoell, 1966). By its provision of broad-band information, biographical data can help counselors and administrators plan the best approaches to help students stay in college. These approaches might go beyond traditional counseling (see Island, 1969; Korn, 1969) or group counseling (Anderson, 1969), to include experimental residence groupings (e.g., Brown, 1968), special courses, or change of college. Perhaps the provision of reliable information about the realities of colleges could help students know what they are getting into, and encourage them to adapt to college requirements with greater skill.

Astin (1975) has recently attempted to carry out some of these tasks. He presented the usual findings, based on 41,000 freshmen at 358 representative colleges, which showed that dropping out was predicted by low academic ability, poor academic and family background, poor study habits, and low aspirations. However, Astin developed worksheets, based on these results, that administrators can use to compute dropout proneness for individual students or groups of students. From his results, Astin recommends a variety of administrative actions to reduce dropout rates. These include: offering work-study programs and avoiding loans; encouraging employment, especially by offering on-campus jobs; and encouraging residency in dormitories. Astin also found that student-body homogeneity enhances persistence; i.e., students are less likely to drop out if they attend a college whose other students are similar in religion, race, and size of their hometown. Obviously, this last finding is more difficult to use. Astin makes additional recommendations concerning counseling, tuition, and facilities construction. As Astin's study indicates, there are ways to use research findings to influence student attrition in college.

Biographical information related to student activism

In the recent flood of materials about student activism, there have been a few large scale, competently performed empirical studies (see the bibliography by Altbach and Kelley, 1973). For example, Jansen, Winborn, and Martinson (1968) found that background variables, simple self-descriptions and self-reports of behavior distinguished between different types of student leaders at Indiana University. The groups included political action groups, residence hall leaders, fraternity leaders, and activities leaders. Astin (1968b) found that background information predicted with some efficiency whether students would participate in protests against the Vietnam War, racial discrimination, or the policies of the college's administration. Furthermore, Astin found that demographic characteristics of the freshman class predicted the extent of protest on campuses with considerable efficiency, when the institution was used as the unit of analysis. Kahn and Bowers (1970) found that socioeconomic status was related to activism, but that this was the case only in highly selective institutions. The same pattern also held for the number of hours

spent studying, grades, and majoring in social science or humanities. Being "intellectually oriented" was related to activism in colleges at all levels of selectivity.

Baird (1970) used many of the types of biographical information reviewed in this monograph. Using a scale of degree of activism, Baird found that students exhibiting many behaviors one would classify as "activism" were characterized by: self-ratings describing themselves as socially ascendent and capable, socially sensitive and gregarious, aesthetically talented and independent; life goals concerned with holding power and directing others, helping and community service, and intellectual activity; high school nonacademic achievements, in every area, especially leadership; and interest, potential, competency, and personality scales suggesting social and leadership abilities, writing and artistic talent, and self-assertiveness.

Flacks (1970) reviewed the empirical evidence concerning the social bases of activism, and came to several conclusions:

- Movement participants tend to be recruited from the most selective universities and colleges; the highest incidence of offcampus and oncampus protest activity has occurred at major state and private universities and prestigious liberal arts colleges. (This may be because such institutions attract or select "protest-prone" students.)
- Student protesters are rarely recruited from among those with below average grades; there is some tendency for those with high grades to be disproportionately represented in protest activity.
- In terms of aptitudes and interests, activitists tend to be more "academic" than nonactivists. (Perhaps a better way of putting this is that activists are more intellectually oriented. Activists do not always hold traditional academic values.)
- Activists are disproportionately recruited from a particular social background: they are the sons and daughters of high-income families, in which both parents have at least four years of college and tend to be employed in occupations for which advanced educational attainment is a primary requisite.
- The typical activist's family is quite secular; however, a significant minority of activists come from families with a strong religious orientation.
- The typical activist's parents are politically liberal; the proportion of activists who have "converted" from a background of conservatism is quite small, as is the proportion who have parents who are themselves left-wing or liberal activists.
- The religious secularism and political liberalism characteristic of activist families are expressions of an underlying cluster of values articulated by parents and shared by their activist offspring.
- Activists tend to come from homes in which a relatively democratic and equalitarian child-rearing ideology was emphasized; there is little evidence, however, for the popular view that student protest is related to parental over-permissiveness or indulgence.
- Although the prototypic background of student activists is the "educated humanist" family, factors other than family background are also important in determining recruitment to the movement, and forms of participation in it.

Although Flacks was not concerned with the issue of biographical information, it is apparent that many of his conclusions are based on biographical data. It may be that it is not possible to understand the roots of activism without biographical information.

It is difficult to suggest possible uses of such analyses. It might be possible to use this information to identify possible activists, but the idea of barring students of this type would be abhorent to many college officials. Furthermore, such students would be inclined to attend selective colleges, be intellectually oriented, come from liberal, educated, and humanist families, and have unusual potentials for leadership; and these are just the sorts of students many colleges look for and that society needs.

Section III: The prediction of creative and high level accomplishment with biographical and self-report information

People have been concerned with the prediction of creativity and high level accomplishment for many years. Thousands of years ago, the Chinese developed the imperial examination system in an effort to find people who would be outstanding officials and ministers of the state. More recently, researchers have undertaken a wide variety of studies to determine the antecedents of high level accomplishment in science, writing, creative arts, and leadership. This review summarizes some of this research, and shows that there is evidence that creativity and high level accomplishment can be predicted with some success, even if we do not have a complete understanding of the processes of creativity and achievement. Much of this research has been conducted with samples of college students and professionals working in industry.

Consequently, since our major interest is in regard to what the research findings suggest might be done to improve educational admissions, our argument will have to be somewhat indirect. However, many of the questions that apply to admissions have been addressed in research in other areas. Their results are more relevant than they might at first appear to be. The material reviewed here is concerned with biographical and other simple predictors of creativity and high level performance. Studies of the creative process (Golann, 1963) or of the personality of persons who achieve at high levels (recently reviewed by Dellas and Gaier, 1970) are, of course, very valuable in our search for the bases of high level accomplishment, but this review concentrates on biographical or background information about previous activities and accomplishments. Without attempting to cite all the comparative success of studies using different classes of variables to predict high level accomplishment, we simply assert that, from the current evidence, the conclusion of Taylor and Holland (1964) still stands: biographical information is consistently the best predictor of creative and high level performance. Further, information about the biographical precursors and the development of accomplishment could lead to changes in personal, educational, or organizational practices that would foster greater accomplishment.

This review also concentrates on studies of real-life criteria of accomplishment, following the guidelines of MacKinnon (1962). These include: originality, uniqueness, or statistical rarity; adaptation to reality, aiding in the achievement of some real-life goal, such as a scientific or aesthetic problem; and sustained activity leading to the development, evaluation, and elaboration of an original idea. Studies based on such criteria as having a "creative" profile on a personality test, or other arbitrary classifications devised by a re-

searcher receive less attention.

Biographical inventories of earlier activity and accomplishment have been related to creativity and high level accomplishment in several populations: college students, high school students, scientists, and professional people (professors, doctors, lawyers, and so on). These studies will be reviewed in the sections that follow. They are presented here as evidence for the power of measures of accomplishment at one level to predict accomplishment at another. Their relevance for college admissions decision-making will be discussed in the final section.

College students

Creativity and high level accomplishment among students has been examined in many studies. As a natural outgrowth of their concern for identifying talent, the National Merit Scholarship Corporation reported a series of studies concerned with high level accomplishment. These studies found many significant relationships between biographical information and achievement in college. "Achievement" measures consisted of such statements as: "Had a scientific or scholarly paper published (or in press) in a scientific or professional journal," "Received an award for acting, playwriting or other phase of drama," "Was editor or feature writer for collegiate paper, annual, magazine, or anthology, etc.," "Composed music which has been given at least one public performance," "Won a prize or award in an art competition, painting, sculpture, ceramics, etc.," "Organized a college political group or campaign." Scales were developed for six areas: science, art, music, leadership, drama, and writing. In studies by Holland and Nichols (1964), and Nichols and Holland (1963), nearly every major test that has been suggested for the prediction of accomplishment was used in the predictor battery, including personality scales of all sorts, interest measures, assessments of cognitive styles, "creativity tests," and high level ability tests. The best predictor of accomplishment in college was accomplishment in the same area in high school, as measured by simple check lists of nonacademic achievements. (Similar results have been found in a large sample study of more typical students, Baird, 1969a.) Other National Merit studies by Roberts (1965) and Nichols (1966) studied the item correlates of high level accomplishment. Roberts developed scales for six areas of accomplishment: science, art, writing, music, leadership, and speech (as defined by the same sort of items described earlier). In general, more achievers in each area endorsed the items expressing interest, activity, or competence in each area than did the nonachievers. These items tended to be directly related to the kinds of accomplishments later exhibited in college. As Roberts states: "Many of the items in each scale were directly content-related to the area of criterion achievement, and a fair number were related to other specific areas of activity and achievement." For example, in the science scale, more than half the positive predictors were "direct indicators of scientific activity or interest and several others may be 'technological' in nature (for example, photography, nature collections)." Nichols' correlations also indicated that previous behaviors were generally the best predictors of high level accomplishment in both a Merit sample and a sample representing a broad range of talent. (Biographical information about previous accomplishments was a better predictor than the personality, interest, or ability scales that Nichols also used in his study.) Similar National Merit studies reached similar conclusions (Holland, 1961; Holland and Astin, 1962).

Other studies, using large samples of average students, have shown that scales measuring high school nonacademic accomplishment are the best predictors of later accomplishment in college and have sufficiently high correlations to be of practical use (Richards, Holland, and Lutz, 1967; Holland and Richards, 1965, 1967; Richards and Lutz, 1968; Baird, 1969a). Ability, personality, and

interest measures were generally poor predictors in these studies.

The need for measures of out-of-class accomplishment in addition to measures of academic accomplishment is evidenced by the fact that, in all these studies, there was little relation between grades, academic ability as measured by test scores, and later accomplishment. The need is further emphasized by the work of Wallach and Wing (1969) who replicated these studies in their study of Duke University students in which little relationship between academic and nonacademic achievement was found using methods other than correlations. Baird (1968) similarly compared bright and average students and found little average difference in their nonacademic accomplishments. Elton and Shevel (1969) further clarified the issue by examining individual items on six scales of accomplishment and finding that some out-of-class accomplishments were related to measures of academic talent but about an equal number showed a negative or no relationship. The same lack of relation was found by Holland and Richards, 1965, 1967; Richards, Holland, and Lutz, 1967; Richards and Lutz, 1968; Baird, 1969a, b; and the American College Testing Program, 1973.

High school students

The studies of high school students provide somewhat indirect evidence of the power of measures of previous accomplishment to predict later accomplishment. They are reviewed here because they show that previous activity and experiences are also related to later accomplishment, as well as earlier accomplishment. Long term activity and interest in an area may not result in publicly recognizable accomplishments, but they do show that behaviors consistent with later accomplishment are important; accomplishment does not appear overnight. Taylor, Cooley, and Nielson (1963) applied a biographical questionnaire, developed on NASA scientists and which concentrated on previous activity and accomplishments, to high school students participating in a National Science Foundation summer program. Using ratings of the creativity of the students' research performance as the criteria, the biographical questionnaire proved to be the best overall predictor.

Schaefer and Anastasi (1968), and Anastasi and Schaefer (1969), developed biographical inventory keys against criteria of creative accomplishment among high school boys and girls. Separate keys were developed for science and for art and creative writing. They were cross-validated in second criterion groups. Cross-validated validity coefficients among the boys were .35 and .64 for the science and art-writing scales, respectively. For girls, art and writing were predicted in a cross-validation with correlations of .34 and .55, respectively. Using a similar biographical inventory and the same sample, Schaefer (1969) was able to predict creative performance in art for boys (.65), writing for girls (.55), and, in combination with personality scales, science for boys (.48), and art for girls (.55). In their discussion of the contents of these scales, Anastasi and Schaefer (1969) pointed to the common characteristics of high performing adolescents (with some support from other studies). These were: continuity and pervasiveness of interest in the students' chosen field; prevalence of unusual, novel, and diverse experiences; and the educational superiority of the students' family background. The first point deserves some reemphasis. Two recent studies (Baird, 1968, 1969b) indicate that accomplishment often begins in adolescence or before in exploratory activity, often resulting in recognized achievement. Baird and Richards (1968) and Baird (1969b) found that such accomplishment seldom begins in college; there are few "late bloomers." The great majority of students who show accomplishments in college showed similar activities in high school. Anastasi and Schaefer (1969) point out:

"Typically, the highly creative adolescent girl in this study had manifested an absorbing interest

in her field since childhood and her creative activities had received recognition through exhibitions, publication, prizes, or awards. Her initial interest was thus reinforced and reinforced early in life by persons in authority, such as parents and elementary school teachers. The continuity of creative achievement over time is corroborated by the findings of other investigations, notably Helson's (1966, 1967) research with college women, the surveys of National Merit Scholarship finalists (Holland and Astin, 1962; Nichols and Holland, 1963), and our own earlier study of creative high school boys (Schaefer and Anastasi, 1968)."

Similar results are reported in studies of industrial, scientific, and professional samples, as reviewed below.

Predicting creativity and high level accomplishments among scientists and other adult groups from biographical records of accomplishment and activity

Biographical variables dealing with past accomplishments, past activity, and interest similar to those just described have been found to characterize scientists who have demonstrated a high level of accomplishment. For example, Roe (1952) found many unusual biographical characteristics of scientists in her sample. Kulberg and Owens (1960) and Morrisson, Owens, Glennon, and Albright (1962) found that biographical information correlated with the creativity, professional interest, and research competence of engineers and scientists. Albright and Glennon (1961) found that biographical variables distinguished between supervisory and research oriented scientists at all levels of a laboratory organization. Smith, Albright, and Glennon (1961) also found that biographical information predicted rated scientific competence, rated creativity, and number of patents within a group of research scientists. These three criteria were predicted in a cross-validation sample with correlations of .61, .52, and .52, respectively. The content of the items suggests high self-confidence and high self-conception. "This interpretation is reinforced by the frequency with which the high criterion groups say that they: have more readily taken advantage of opportunities presented them; consider their achievements thus far to be greater than those of others with the same education; work more quickly than others; and prefer to have many things 'on the fire' simultaneously." It might be noted that this description was based primarily on answers to factual questions about the scientists' accomplishments. Chambers (1964) used both biographical and personality test variables to study creativity in chemists and psychologists. Three personality scales and 16 biographical items were significantly related to the criterion of creativity. Compared to their less creative colleagues, the more creative scientists more often had fathers who were professional men, graduated from high school earlier, spent more hours per week (more than 50) in study and research in graduate school, published more articles then, and more often met their graduate school expenses by scholarships and fellowships than by part-time work.

McDermid (1965) found that biographical variables were the best predictors of supervisory and peer ratings of high level (in this case, creative) performance. McDermid also used personality tests (the California Psychological Inventory and the Adjective Check List), an interest test (The Vocational Preference Inventory), a high level intelligence test (Concept Mastery Test), the Social Insight Test, and Welsh Figure Preference Test. All these tests had been used in other studies of creativity, but were not useful in McDermid's sample of engineering personnel. McDermid concludes: "The correlations obtained in this study between paper and pencil tests and the criteria of creativity were so low as to be virtually useless for predictive purposes; biographical data, on the other hand, proved to be significant as predictors of both supervisory and peer ratings of creativity.

This finding, of course, is quite consistent with the practical dictum that the best predictor of future performance is past performance. . . ."

Taylor and Ellison (1967) summarized eight years of work on the identification of biographical predictors of scientific performance. In the last NASA scientist samples the cross-validated correlations with ratings of creativity were .41, with the number of publications .62, and with GS level .72. The factors in the Taylor and Ellison study were consistent both with other studies of accomplishment in science and the studies of students just summarized. For the highly performing scientists, as for the students, the tendency was to have a conception of themselves as capable of high level professional performance, to be independent of others' opinions, be greatly dedicated to their work, to work very hard, to have clear ideas of their goals (which they set at a high level), and to be intellectually oriented—a trait that developed early in adolescence.

Finally, Munday and Davis (1974) have shown that biographical accomplishment scales administered in high school predicted adult accomplishment six years later. The adult accomplishment measures included such items as: "was author or coauthor of scholarly or scientific article accepted for publication in a popular or professional journal or presented as a public lecture," "received an award for acting or some other phase of drama," "sold one or more works of art to collectors, museums, or the general public," "won a literary award or prize for creative writing," "composed or arranged music which was publicly performed," and "been a candidate for election to school board, city, county, or state office."

The median correlation between the high school accomplishment scales and the corresponding adult scales was .25 for men and .26 for women when graduates and nongraduates are combined. In contrast, the median correlation between high school grades and adult accomplishments was .03 for men and .00 for women, and the median correlation between ACT composite scores and adult accomplishments was .06 for men and .10 for women. The median correlation between college grades and adult accomplishments was .09 for all students combined. This study is important because it shows the long range validity of the biographical accomplishment scales, even after the intervention of college and work, and illustrates, again, their superiority over other measures.

In summary, the studies we have reviewed support the conclusions reached by Baird (1969a):

"There is some consensus, then, that students who later achieve . . . (in creative activity, as well as academic activity) have engaged in activities and developed skills related to that area, have conscious goals and desires to achieve in that area, and describe themselves as having ability in that area.

". . . The achiever . . . has a history of activities and achievements related to his present achievement. He is motivated to achieve in this area and accurately assesses his own talents. Perhaps rather than attempting to develop new scales to describe some universal creative mind, psychologists should concentrate on the development of more accurate and reliable measures of past activities, goals, and self-description."

These results and those of the student samples suggest that measures of accomplishment could be used for the early identification of students with the potential for high level accomplishment, and as one of the bases for selecting students for special programs. In most of these studies, biographical information about past accomplishment was the best predictor of later performance, better than ability, interest or personality tests, suggesting the power of these variables for particular purposes.

Some questions about direct assessment of biographical accomplishment scales

We have just seen the power of biographical accomplishment information to predict subsequent high level accomplishment. The studies just reviewed indicate that this information is considerably more useful than most other kinds of information. However, before one considers using these kinds of data in practice we need to answer three questions about it: Can we believe students' reports? Can measures be constructed that meet standard psychometric criteria? How could such measures be used in real-life selection, placement, or guidance situations?

- *Can we believe students' reports?* As the earlier review of the validity of self-reported accomplishments (Maxey and Ormsby, 1971) and the review of the accuracy of self-reported grades indicated, students' reports of their high level accomplishments can be believed. The validity of questions about past accomplishments appears useful enough for the decisions and actions that they could be used for.
- *Can biographical measures of accomplishment be made psychometrically adequate?* The studies of the scales developed by the National Merit Scholarship Program (Nichols and Holland, 1963), the research on more typical college students (Richards, Holland, and Lutz, 1967; Richards and Lutz, 1968), and the operational work of the American College Testing Program (ACT Technical Report, 1973) show that biographical accomplishment scales can be constructed with adequate reliability. Occasional skewness in the scales does not present a serious limitation (Holland and Richards, 1967). The validity of the scales does not seem to be affected by restrictions of range on academic talent (Holland and Richards, 1967; Baird, 1969a). The validity of the scales, discussed herein earlier, also indicates the psychometric adequacy of the scales. All of the results may be underestimates because of the brevity of the scales used in these studies. In short, it appears that biographical accomplishment scales can be constructed that meet standard psychometric requirements.
- *Can biographical accomplishment scales be used in practice?* Biographical accomplishment measures have seldom been used in real-life studies of the selection of college or graduate students, and hence there are few guidelines for the person who would like to make use of these variables. Several industrial studies provide some stimulating suggestions, but they are few and far between. Certainly, very few, if any, colleges or graduate departments have made past extra-academic accomplishment the most important basis of their selection procedures. However, a study by Baird and Richards (1968) simulates what would happen if various selection procedures were followed for admission to college. This study suggests some of the practical problems of using accomplishment data in selection decisions. The authors compared the results if: only academic criteria were used to admit students to college; only criteria based on previous creative accomplishment in each of six areas were used; and both academic and creative accomplishment were used. A close examination of the results shows that an educational institution cannot have everything. For example, if an institution selected students only for high level accomplishment rather than for grades, it would increase its dropout rate. However, an institution could still make use of nonacademic predictors of creative accomplishment. For example, as Baird and Richards suggest, ". . . a college could decide which areas of achievement it wished to emphasize; that is, whether it preferred more or fewer students with potentials for achievement in leadership or science, art or writing, speech and drama or music."

A college or graduate school's choice of a particular selection strategy is a function of the outcomes it values most. Institutions must choose the

relative value of obtaining: a group of students who will attain high grades; a group of students who will achieve in the accomplishment areas it is interested in; a group of students who will not drop out, or some other group of students that it values. While an institution can obtain a student body that will show various proportions of these outcomes, it would be hard pressed to find an incoming group of students that is desirable in every way. On the other hand, a college or graduate department can obtain a group of students who will be aligned more closely with its purposes and goals.

Implications of these results

More and more students delay entry to college after high school, leave college for a few years, and seek unusual work or other experiences during their breaks from their studies. In addition, more students work during college, and more older students are entering colleges. Many of these students have had educationally valuable experiences outside the classroom, for which they receive no credit. Many colleges have also begun a wide variety of off-campus programs of independent study, work experience, and public service, and so on. In this way, many students have opportunities to develop and demonstrate talents they would not otherwise have had.

Clearly, tests and traditional undergraduate transcripts do not provide adequate means of recognition for these kinds of learning and accomplishment. For these reasons, it is important to find ways to assess the accomplishments of students.

A second purpose in assessing students' accomplishments is to select students who are likely to be productive, to be creative, to provide leadership, and to make a contribution to their fields. Many admissions committees, faced with large numbers of applicants and dwindling funds, feel the need for some way to assess the high level noninstitution-sponsored accomplishments of students. They wish to have some way of selecting students who will be outstanding students and who will eventually contribute most to society. As the review of research indicates, the most efficient information for predicting future accomplishments is data on previous accomplishments. The studies reviewed show that the best predictors of future high level, real-life accomplishment in writing, science, art, music, and leadership are similar accomplishments, albeit at a lower level, in previous years. In fact, as with all other behavioral and scientific prediction, which is based on the consistency of the same or similar phenomena over time, the studies indicate that up to now the most effective predictor of high level accomplishment is clearly past high level behaviors of the same or similar types. People who have been outstanding in a wide variety of areas in science, literature, creative arts, and public affairs have been shown to have had accomplishments in those areas in their college years. The institution that wishes to have graduates who will be outstanding in their fields in the future might well consider the previous accomplishments of their applicants. To date, information about past accomplishments has proved to be a far better predictor of high level accomplishment than measures of ability, interests, or personality. As the review also indicates, scales of real-life accomplishments can be constructed that are reliable, usable, and seldom faked. They can be used in selection decisions in a variety of ways. They seem particularly useful when there is a need to assess talents somewhat removed from academic ability, such as artistic capacity, musical skill, ability to write expressively and forcefully, dramatic power, and the intuition needed to devise a scientific experiment. As these examples suggest, the assessment of talent is more difficult in some areas than in others and, consequently, the predictive power of the variables will vary from area to area. In any case, these measures cannot replace measures of academic talent; they simply

provide indications of capacity in and out of class in other areas that are useful for specific purposes. In this way, the range of talents that institutions consider in their applicants could be greatly expanded. Thus, an institution could not only select students who will get good grades, but students who will be good organizers of research, leaders in political and nonpolitical organizations, good writers, and inventive experimenters.

Another important reason for developing measures of in- and out-of-class activity is that the student applying for study has a right to be able to present his or her skills, talents, and achievements to selection committees. As recommended by the College Board's Commission on Tests, students should have some choices in the picture of themselves that selection officers see. (There is another positive outcome of the inclusion of this sort of information. The students who complete a form that asks for their personal accomplishments feel that they are being taken more seriously, and that they have had a chance to present their best side.)

Assuming the accomplishments of informal education are important, what accomplishments should we assess, how should we assess them, and can we assess them (i.e., is it practically feasible to assess students' accomplishments in a regular, programmatic way)?

- *What to assess?* The studies examined in the review suggest that questions on accomplishments are better predictors, the more closely they resemble the real life criteria they are designed to predict, the more direct they are, and the more recent are the behaviors to which they refer. It would seem that the kinds of school accomplishments that are educationally and socially relevant, and similar kinds of previous accomplishments can be identified. The desired behaviors will vary from field to field, of course. The accomplishments important in biological science will not necessarily be important in art, those in the humanities not necessarily important in physical science, etc. Thus, different accomplishments need to be assessed and summarized in different areas. Another assessment decision is about the level of behavior or involvement to be assessed. Should only high level accomplishments that receive public recognition be assessed? Perhaps the best answer to this question is to point out that high level accomplishments are usually preceded by a great deal of similar effort that is not or cannot be given public recognition. It is also important to assess these accomplishments. However, the emphasis should be placed on accomplishments that show long term persistence and originality and require complex skills for their attainment (Holland and Richards, 1965). Given these criteria, a range of accomplishments should be assessed, from fairly common but private ones, to rare and public ones. The goal would be to assess bands of competency, so that students could be given scores indicating different levels of accomplishment.

Of course each college needs to validate the information about earlier accomplishments in its own environment just as colleges need to validate admissions tests and high school records in their own institutions. Moreover, if many colleges actually began to select students on the basis of their earlier accomplishment it is possible that students would begin to exaggerate their achievements. This aspect will be discussed in the next section.

- *How to assess?* Once we have decided what to assess, we need to decide how to go about doing it. The method chosen should be as simple, clear, and direct as possible, so that students will have little difficulty responding accurately, and so that the results can be interpreted readily. However, the approach should also deal with the fact that students may exaggerate their achievements. Essentially, there is concern that some students will fake their responses to any self-reports of accomplishments unless there is some mechanism to check their claims. Although research

indicates that faking in these areas is very rare, some mechanism for verifying student assertions needs to be developed in order that the claims of students may be believed by admissions committees. Clearly, the claims of every student cannot be checked. Students' interests and accomplishments are too diverse and widespread to allow any systematic and thorough documentation. What could be done in lieu of such checks? There are several possibilities. One is simply to identify the student who claims too many achievements in too many areas. For example, the student who claims to have served as class president, written a novel accepted for publication, won a state music contest, published a scientific article as well as having sold several paintings is suspect (Holland and Richards, 1967). Cutting scores can be devised for identifying such exaggerators, and (to allow for the possibility of a modern Leonardo da Vinci) some methods devised to ask the student for proof of the accomplishments, including the time, place, and exact character of the accomplishment. Another strategy would be to follow the example of Kirk and Sereda (1969) and construct a "profile" of the person who is likely to exaggerate. (Kirk and Sereda found that students who exaggerated reports of their past grades were ambitious, worried about status, and had parents who pressured them to achieve.)

A third possibility would be to audit a small percentage of the students' forms on accomplishments that can be verified easily. (The forms would probably include a number of accomplishments that would be extremely important but difficult to verify. If only those easily verifiable were included, the content would be too narrow to be predictive.) Students might be either required or requested to identify someone who could verify each major area of activity.

A fourth possibility is to include fake items in the list of accomplishments, such as "Placed first, second or third in the area Sears Science Program Contest." The point that should be emphasized here is that it is much more important to consider creative accomplishments of students in the admissions decision than it is to avoid considering the occasional student who exaggerates. There are many honest students whose accomplishments are several. And, according to empirical research, those who exaggerate are not numerous. In any case, one or a combination of the suggested systems could be used to identify those students who are possibly exaggerating; and, thus, to keep their number to a minimum.

▪ *What is feasible?* Assuming answers to the questions of what and how to assess, we need to consider what would be feasible for a university or for an organization like the College Board. The questions used should be appropriate for mechanical data processing. Today, in relation to the current volume of candidates, the available technology, and the need for compatability with operational systems now in use, the most efficient system would be one in which the questions are presented in a multiple response format that could be edited and recorded by optical scanning scoring machines. This requirement makes write-in responses, for example those used in the *Independent Activities Questionnaire* developed by Klein when he was at Educational Testing Service, more difficult to use. However, it is unlikely that any single list of accomplishments could cover the vast diversity of human activity and accomplishment. Strong consideration must be given to write-in forms, free-response formats and such techniques as microfiche photographs of students' productions so that this diversity can be assessed with thoroughness and fairness to the student. Thus, a variety of formats should be considered. Each technique would require a development project to construct standard assessment procedures, evaluation criteria, and reporting systems. Whatever the format, the questions should have face validity to candidates, and they should be briefly stated and relatively simple. They should not be complicated, tedious, and tax-

ing to the student's memory of exact details (charges that were leveled against the *Independent Activities Questionnaire*). In addition, the questions should reflect important cultural and background differences among applicants. It may be especially important to consider the lack of opportunities for achievement among disadvantaged students. Science equipment, art supplies, musical instruments and so on are beyond the budget of many disadvantaged families. To be fair, it may be necessary to consider disadvantaged groups separately.

Summary

The implications can be stated fairly briefly. (1) Since the consensus of the studies indicates that information about past accomplishments is the best predictor of later accomplishments, admissions committees who wish to select students with the greatest potential for future accomplishment should look for evidence of students' past accomplishments. (2) Satisfactory measures of past accomplishments have been constructed at several levels, so it seems plausible to believe that such measures can be constructed for many admissions decisions at other levels. (3) The measures that have been constructed appear to have adequate reliability, accuracy, and validity, so it seems plausible to think that measures deemed adequate in these ways can be developed for most admissions decisions. (4) The measures seem independent of academic aptitude, so similar measures for admissions would probably add a good deal of information of a new kind to the admissions situation, and (5) studies simulating the use of these measures show that different selection strategies produce different results. Schools, therefore, should not see these measures as panaceas, but as a new kind of information.

We have found biographical accomplishment information to provide useful prediction of later high level accomplishment in a wide variety of samples and settings. In these studies, no other class of variables proved nearly so useful. The information seems appropriate to the assessee, it can be made psychometrically adequate, and it can be used in various selection strategies. A strong case can be made for the utility and value of biographical accomplishment information.

Section IV: Biographical information as an assessment of students' educational backgrounds

Students bring their homes, peers, and communities with them when they enter college. The general degree of compatibility of these background factors with the college experience can have a powerful effect on students' satisfaction as well as on their educational growth and development.

SES

Students from working or lower-middle class homes, or from rural backgrounds, generally have had less stimulating intellectual and cultural experiences. As summarized by Feldman and Newcomb (1969), students of lower SES, compared to their higher SES counterparts: are less culturally sophisticated (Peterson, 1965, 1968; Hartnett and Peterson, 1968; McLaughlin, 1965); have had a more restricted range of experiences (Baird, 1967; Matteson, 1955); and are more likely to be oriented to college in terms of vocational or professional training and less likely to be oriented in terms of intellectual growth (Baird, 1967; Gottlieb, 1962; Lane, 1960). (Some of the voluminous studies of behavioral differences among social classes are summarized in Centers, 1949; and Berelson and Stiener, 1964. They are reviewed in a popular book by Packard, 1961.) To illustrate what differences in SES can represent, it is useful to examine the items and differences found in a study of social class and the urban school (Herriott and St. John, 1966). These authors present details on broken homes, welfare payments, parents' employment and unemployment, transfer rate from other schools, adequacy of clothing, condition of teeth, diet, quality of medical care, parental attendance at school events, parental interest in children's academic or extracurricular accomplishments, supervision of students, delinquency, disturbances in class, being held back a year, student effort on assignments, and degree of congruity with teachers.

It is unlikely that many students entering college would have all the problems that this list suggests, but some low SES students probably have come from homes and schools that hampered rather than aided their academic growth, and these experiences affect their approach to college. These educational differences have been found to be related to adjustment in college in several studies. Lane (1960), for example, found that female students from lower SES backgrounds, when compared to students from higher SES backgrounds, had a more difficult time adjusting to certain academic and social demands at Stanford, as measured by self-report and peer ratings. Similar results were found among Vassar freshmen (Freedman, 1967), and Yale men (Davie, 1958). The results are not unequivocal, for dissertations by Whyte (1963) and McLaughlin (1965) indicated that lower SES students at Cornell and

Harvard were as satisfied with their college, if not more so, as were higher SES students. But overall measures of satisfaction may not be the most sensitive measures of adaptation to college. It seems probable that students from varied backgrounds will have different adjustment problems in college.

Jones and Finnell (1972) directly studied the relationships between college experiences and attitudes of students from economically deprived backgrounds. Using the College Student Questionnaire (Peterson, 1965), they found that:

"... students from economically deprived backgrounds did experience attitude changes. On one scale—family independence—the change was significant. Obviously, the influence of the low socioeconomic background did not neutralize the influence provided by the college environment.

Attitude changes in students from economically deprived backgrounds, however, resembled the changes that occurred in college students in general. . . . The only significant difference in the attitude changes in economically deprived students and college students in general was in the area of family independence. This means that students from low socioeconomic backgrounds became more autonomous in their attitude toward their parents and families. The significant change in attitude may be attributed to a situation whereby their two years in college had introduced these students to an environment which afforded more physical comforts and other attractions than could be provided by their families; hence an attitude of less psychological dependence insofar as their families are concerned." (p. 317)

Jones and Finnell also correlated the extent of attitude change with specific college experiences. Thus, students who enrolled in speech and dramatic arts courses changed significantly more than other students on the scale of family independence. There was also a positive relation between changes in scores on the cultural sophistication scale and enrollment in courses in psychology and history, and a negative relation between changes in liberalism and part-time employment. Changes in the scales of social conscience were related to enrollment in psychology courses, attendance at concerts and lectures, and participation in intramural competition. This study does not show how specific college experiences might have different impacts on students from different backgrounds.

Baird (1969) attempted to study the relative influence of social class background and other variables on students' aspirations. In a randomly selected sample of 21,110 college applicants, Baird compared students with different degree plans and different family income levels. He was particularly interested in students from low income families who aspired to Ph.D. or professional degrees and students from high income families who aspired only to complete junior college. Students were compared on their responses to the Student Profile Section of the ACT assessment, a self-report instrument concerned with the students' plans, educational values, and academic and nonacademic achievements. Baird concluded:

"The most obvious general trend in these results is that students with discrepant family incomes and degree goals were more like other students with the same degree goals than they were like students from families with similar incomes. In a few comparisons the differences between degree goals were accentuated for the students with discrepant family income and degree goals. Thus, although there was a positive relation between family income and degree plans, income alone did not seem to be as powerful a determinant of degree plans as other characteristics considered singly.

"Within this sample, there was a slight positive association between family income and the ACT Composite Score. This suggests that the students from less wealthy families who aspired to high level degrees were over-achievers, while students

from wealthy families who aspired to low level degrees were under-achievers. These results also suggest that these students vary in general "drive" and motivation to achieve. This idea gains support from the scores of these groups on the nonacademic achievement scales. The level of involvement in nonacademic achievement also suggests that the students with higher degree goals had enthusiasm as well as a high activity level. Thus a number of variables suggest that students of low family income who plan various degrees select appropriate goals and see themselves as potential holders of those degrees.

"The students from wealthy homes who planned only a junior college degree had low ACT Composite Scores and generally low scores on the nonacademic achievement scales, except in art. When they chose a college, they placed less importance on high scholastic standards or financial aid offers (they were probably unlikely to have received such offers).

"Finally, students with discrepant family income and degree plans generally seem to have chosen appropriate degree goals, considering their other characteristics. That is, students with similar degree plans were more like one another than they were like students from families with similar incomes, suggesting that there is a pool of talented students who, at the beginning of college, plan to obtain advanced degrees and enter the professions regardless of family income. The extent to which they attain these goals contributes greatly to social and economic mobility within American society." (pp. 19-20)

In what is probably the largest scale investigation of the effects of low family income on the careers of students yet conducted, Holmstrom (1973) studied a sample of 34,346 students in 252 colleges. He compared a subsample of low-income students with a subsample of other students on a wide variety of variables collected on the American Council on Education's Student Information Form, a self-administered questionnaire filled out during freshman registration or orientation periods, and related their responses to a followup questionnaire administered four years later. Holmstrom concluded:

"The implications of the present study are clear. Aside from the expected dissimilarities in their demographic and background characteristics (e.g., father's occupation), the low-income undergraduate does not differ dramatically from his more affluent classmates. He shares with them the same life goals, degree aspirations, activities, and interests. He may be more likely to drop out—but only temporarily; he may shy away from student demonstrations; he may get slightly lower grades; but, overall, the likelihood of his attaining his degree in four years is reasonably close to that of his more privileged classmates.

"Although the source of financial support is an important factor in determining the academic success of both groups of students, it should be emphasized that the low-income student is particularly dependent on certain sources of support if he is to make satisfactory progress.

"Finally, low-income students who attend highly selective institutions do better than their counterparts who attend less selective institutions, and this holds true even when differences in ability and in the availability of financial aid are controlled for. That is, given two students who are equally able and who receive the same kind and amount of financial support—one student at a very selective institution, the other at a relatively unselective one—the former student will be more likely to complete the baccalaureate in four years. Although the reasons underlying this relationship are not immediately obvious, the present results suggest that, whenever possible, low-income students should be advised to apply to more selective institutions. It is to be hoped that future research will clarify the special impact of institutional selectivity on low-income students." (pp. 19-20)

There is ample evidence that social background

influences students' vocational choices as well as their educational decisions. Ginsberg, et al., (1951) found that boys from high- and low-income families went through the same stages of vocational development, but their choices were quite different. High-income boys, even at an early age, tended to think they would go to college, and were oriented toward the professions. Low-income boys tended to think of skilled jobs that would pay more than their father's. "They believe there is little that they can do (about vocational planning) beyond selecting a high school where they can pursue an appropriate vocational course."

Werts (1966) found that social class was strongly related to initial career choices. In a subsequent study, Werts (1967) found that when freshmen college students were grouped by academic performance in high school, their career choices were still related to their social class. The professions and social science were above average in SES; education and engineering were below average. Werts also found that career choices depended upon ability at each level of social class, that controls for ability barely affected the influence of social class, and that controls for social class barely affected the influence of ability. SES and ability seemed to be about equally important as influences on career choice among college students.

Once we accept the fact that SES has many effects on education and career choice, what can be done about it? Beilin and Bergin (1956) suggested several ways to increase the utilization of talent in lower SES groups. Scholarship programs should be directed more intensively to low SES students. In addition to funds, this entails distributing information about the programs, encouraging students to apply, and requires the willingness of selection boards to choose truly needy students. Beilin points out that scholarships and occupational information are not enough; low SES youth often feel that ". . . education is not important, the way of life it presents essentially alien; the rewards at the end of the line not worthwhile or not worth the effort, and the goals not achievable. The educational system is seen as hostile and, at the least, offers the minimum of rewards." It is no surprise, then, that low SES students show up as lacking in achievement motivation and certain middle class values, for example, deferment of gratification for later rewards. (Such characteristics are often associated with upward mobility.) The low SES student must be helped to understand that a rise in society by one's own efforts is possible, and must be shown how education is (or can be) related to this rise. Teachers, adults in the community, and guidance officers may serve as role models that will engender educational aspirations. There is some evidence (Baird, 1970; Spady, 1971) that extracurricular successes can lead students to raise their level of aspiration. If lower-class students could be encouraged to engage in a variety of academic and nonacademic activities, their self-concepts and aspirations might be changed. Vocational counseling can also encourage students to avoid premature decisions, and to explore some of the educational and vocational options open to them.

Feldman and Newcomb (1969) have suggested an "incongruity" hypothesis about the overall relation of background to college impact which also leads to a number of possible actions. They hypothesize that ". . . the college will have the greatest impact on students whose orientations are incongruent with the dominant orientation of the college. By the same token, change will be greater among students whose previous environment is discontinuous with that of the college than among those whose environment is continuous." After examining a variety of studies with different designs, purposes, measures, and results, they concluded that the influence of background is complex.

"Our best guess at the moment is that a college

is most likely to have the largest impact on students who experience a continuing series of not-too-threatening discontinuities. Too great a divergence between student and college, especially initially, may result in the marshalling of resistances. Too little might mean no impetus for change. From this point of view, a college's objectives might include a tolerance, or even a desire, for those discrepancies that can stimulate change and growth." (p. 332)

Feldman and Newcomb's working hypothesis, along with other results on cultural sophistication, suggest a number of possible courses of action for colleges. Colleges might seek a certain number of students moderately incongruent with the college's environment. Knowledge of the intellectual and cultural backgrounds of students could help instructors choose teaching strategies that will result in the maximal growth of their students. With the same knowledge, colleges could organize extracurricular programs that would offer a variety of educational experiences to aid the development of students. Counseling programs could use knowledge of student's backgrounds as one basis for understanding students' problems in adjusting to college.

These possibilities may be especially important for students who are the first in their families to enter higher education. For example, as Cross's (1968) review suggests, two-year colleges must face the problem of dealing with great numbers of students with no guidelines about what to expect from higher education. Colleges beginning open-door policies will very probably face similar problems.

Methods for assessing social class. There are a great variety of methods for assessing SES. These can be broken down into the subjective, the reputational, and the objective approaches. They are beyond the scope of this monograph, and the interested reader should consult textbooks on sociological measurement for details. However, one question is particularly relevant to the present purposes; the accuracy of students' reports of their families' status. Very few studies have examined this question, and only one has examined the accuracy of students of the age to apply for college. Kerckhoff, Mason, and Poss (1973) examined the degree of agreement between students' reports and their parents' reports of the parents' education, and the fathers' occupation. The students filled out questionnaires, and the parents were interviewed. The correlations between parents' and students' reports of the mothers' education was .84 for white students and .83 for black students. For fathers' education, the correlations were .89 and .81 respectively, and for fathers' occupation, the correlations were .93 and .74 respectively.

Black students

Knowledge of the backgrounds of students may be especially important for minority group students, notably, black students. Studies of the educational backgrounds and aspirations of black students have accumulated rapidly (e.g., Antonovsky and Lerner, 1959; Bayer and Boruch, 1969; Dreger and Miller, 1968; Epps, 1969; Fichter, 1967; Hartnett, 1970; Hull and Davies, 1973; Lott and Lott, 1963; Rosen, 1959). Perhaps the most comprehensive of large scale studies among these are those by Bayer (1972), Bayer and Boruch (1969), and Fichter (1967). Bayer and Boruch sampled black and white students in 358 colleges, and weighted the replies so that they would be representative of black and white students in all colleges. Their results suggest the breadth of useful information that can be obtained from biographical questionnaires. Their findings show that greater proportions of black than of white students were women; were older; reported lower high school grades; participated in extracurricular activities and had more non-academic achievements; had higher degree aspirations (but less often planned a professional degree); chose majors in the social sciences or

business (but less often chose majors in the physical sciences or engineering); applied to more than one college; were influenced in their college choice by individuals (and were relatively less influenced by characteristics of the institution); grew up in a large city; came from families with less education, occupational status, and income; relied on loans, scholarships, or grants for financial support (and less often relied on family, savings, or employment), and felt unsure whether they would have sufficient funds to complete their education; assigned greater personal importance to such long-term goals as being an authority in one's field, obtaining recognition from one's peers, being well off financially, helping others in difficulty, and becoming a community leader; expected that they would participate in a demonstration, be elected to a student office, and obtain academic honors (and were less likely to expect that they would change their major or career choice, transfer to another college, or marry during college); had somewhat different study habits; had engaged in different activities; and had somewhat more restrictive and utilitarian attitudes toward higher education. These results are quite varied in content and meaning, but they suggest a number of possible practical actions and policies, which will be discussed briefly later. But it is clear that a college with the kind of information Bayer and Boruch provide would be better able to plan for groups of black students.

Bayer (1972) replicated the earlier Bayer and Boruch study by comparing 12,927 blacks with 158,111 nonblack freshmen enrolled in 324 colleges, in 1971. Bayer found few differences from the earlier report. However, there was a slight shift in degree aspirations among blacks; greater proportions aspired to either less than the baccalaureate or to a professional degree. However, the basic picture remained the same in the answers to the great majority of questions in their survey.

Black college students are undoubtably atypical of all black students, but college administrators as well as others might profit from some reviews of the life experiences of blacks as provided by the reviews of Dreger and Miller (1968), Riessman (1962), Pettigrew (1964), Parsons and Clark (1965), and Deutch, Katz, and Jensen (1968). However, as greater numbers of blacks enter college, more colleges will have to plan for students who may have some of the problems of disadvantaged students. Some of these include: nonacademic deviant values and behavioral expectations; relative lack of language facility; relative deprivation of familial support and press for achievement; relative lack of support for academic achievement from peers and lack of adult examples of academic or other success; and relatively low level of self-esteem. Warden reviewed the research in these areas, discussed the academic and social consequences of each area, outlined various programs and actions that have been used to influence these factors, and made suggestions about other possible approaches. A detailed discussion of this research (the problems and programs) is beyond the scope of this monograph. However, it is important to point out that biographical information can assess the standing of students in the five areas listed above, and can help colleges prepare for the educational and psychological needs and requirements of black students.[1] Of course, studies will need to be done to show the predictive validity of biographical data for blacks, and evaluations of the success of intervention programs conducted.

From the first part of this section, it is clear that similar considerations apply to low-income, low SES, white students. Many face some of the same kinds of problems many black students face. The specific content of the problems may differ, but the general aspects are similar in many respects. For example, the peer groups of blacks

1. The July 1973 issue of the *Journal of College Student Personnel* suggests some approaches for working with minority students.

and low-income whites may be different, but the central problem is the same: the lack of peer support for academic achievement. The five areas listed above seem to apply to many white students as well as to many black students. And biographical information can be useful for analyzing these factors for whites as well as for blacks.

Section V: The use of biographical information to predict and understand vocational choice

Biographical information has been used in the study of vocational choice in three main ways: as a substitute for vocational interest tests; as part of vocational classification systems; and as a way to understand the factors in vocational development.

The validity of expressed interest as a measure of vocational choice

Although interest inventories are the traditional tool of vocational counselors, a number of biographical questionnaire items have been proposed as adjuncts or substitutes for interest tests. Of these, simple expressed vocational choice appears to be the most useful. The small number of studies in this area center around two questions: how well does expressed choice do in comparison with interest inventories, and how well can we predict from expressed vocational choice alone?

Dolliver (1969) has conducted an extensive review of studies comparing the relative merits of the Strong Vocational Interest Blank (SVIB) in comparison with direct expressions of vocational choice. (Throughout this discussion, expressed choice refers to responses to such questions as "What job do you plan to be in when you graduate from college?" or "What do you want to do?") Since the SVIB is the most extensively studied and carefully validated interest inventory (for example, Strong, 1935, 1943, 1955; Darley and Hagenah, 1955; Campbell, 1971) the comparison of its results with those of expressed choice are probably the most powerful test of the relative validity of expressed choice versus inventories that can be made. After carefully reviewing the problems in terminology, correspondence between the SVIB and expressed interests, reliability, validity, and experimental design, Dolliver (1969) concluded:

- "There is only a moderate degree of overlap between the results of the SVIB and the results of an expressed-interest method.
- The reliability of the SVIB exceeds that of expressed interests. The reliability of expressed interests is moderately low.
- The predictive validity of expressed interests is at least as great as the predictive validity of the SVIB. In no study where direct comparison was made (Dyer, 1939; Enright and Pinneau, 1955; McArthur and Stevens, 1955) was the SVIB as accurate as the expressed interests in predicting occupation engaged in.
- There is an apparent discrepancy, since expressed interests do not seem highly reliable but yet seem highly valid. This result may be due to the observation made by several authors that expressed interests which develop early are highly predictive. Thus, there appears to be a closer link between the reliability and validity for expressed

interests than for the SVIB.

• There is no evidence to show that the SVIB is superior to expressed interests. Counselors and others have apparently supposed a body of experimental evidence which does not exist. Expressed interests have apparently been given little credence because of studies of "self-estimated" interests, studies of overlap between inventoried and expressed interests, and studies which measured the reliability of expressed interests. The evidence from those studies was taken to be sufficient basis for ruling out the possibility that expressed interests might show substantial predictive validity. As the review indicates, there were very few studies which directly compared the SVIB with expressed interests because of the assumption of the superiority of the SVIB."

In addition, as Whitney (1969) points out, a careful reading of Strong (1953) shows that Strong obtained a correlation of .69 between freshman choice and occupation engaged in 19 years later. The median correlation between SVIB interest patterns over the same period was .72. Strong himself (1955) states: "Estimates by the author of the . . . validity of freshmen choices of occupations are much higher than those previously reported; they indicate that such choices are related in the majority of cases to the work the students will do in later life even when they fail to enter the specific occupation named in the freshman year."

In addition to the studies comparing expressed choices and the SVIB, four other large-sample studies have compared other measures with expressed vocational choice. Cooley (1963) studied the development of scientific interest in boys. Eleventh grade boys predicted what field they would be in. When these self-predictions were compared with the field the student was in after three years, the "hit" rate was 50 percent. A combination of interest scales from the Kuder Preference Record also had a 50 percent hit rate; the rate for a combination of scales from Allport-Vernon-Lindzey Study of Values was 64 percent. Holland and Lutz (1968) found that self-expressed interests had considerably higher predictive validity than Holland's own Vocational Preference Inventory, in a large sample of college freshmen followed up a year later. In a study of the Project TALENT sample, Cooley (1967) found that expressed choices in ninth grade predicted grade 12 expressed choices as well or better than a 17 scale interest inventory that was used (54 vs. 53 percent correct predictions). Richards (1970), also using Project TALENT data, found that simple expressed choice (a "one-item test") predicted nearly as well as the best combination of variables taken from 138 variables.

Gade and Soliah (1975) compared the predictive accuracy of self-expressed career preferences, collected as part of the American College Testing Program's routinely administered Student Profile Section, with an interest test, the Vocational Preference Inventory. Both instruments were completed before the students entered college. The criteria were: the majors in which students graduated from college; and the initial full-time employment of the students as recorded by their university's placement center. All variables were classified into Holland's system (1966). The subjects were 351 male graduates. Expressed choices were significantly more nearly accurate than the interest test information in predicting final major (67 percent were in the same category using expressed choice versus 50 percent using the tests), as well as the initial career fields the students entered (62 percent versus 49 percent). Expressed choices were also superior when the definition of accuracy was expanded to include categories of fields that were congruent with the categories "freshmen choice" or "test scores," according to Holland's theory. For graduating major, the percentages were 81 percent for expressed choice and 74 percent for the interest test; for initial occupation, the respective percentages were 81 and 76 percent. The authors concluded:

"Although the authors do not recommend the abandonment of the use of interest tests, the data do suggest that college counselors can eliminate the need to require every client who has a vocational or educational concern to take an interest test. Furthermore, the results suggest that counselors can have confidence that for many clients expressed choices have as much validity, if not more, for use in long range college and career planning as inventorized interests have. Inventoried interests may continue to be valuable tools for counselor use with clients who are undecided about vocational plans or with uninformed clients who can learn from the experience of test taking about the range of occupations in the world of work. . . . Yet, it does not seem wise for counselors to rely only upon the administration of interest inventories for every client who considers a long-range vocational decision." (p. 120)

Finally, in a carefully conducted study, Norris and Katz (1970) gave a battery of tests to nearly 20,000 eleventh grade students in a national sample. These students were followed up as twelfth graders and again a year after high school graduation, resulting in a final sample of approximately 6,000 students. The investigators were thus able to study the prediction of grade 12 and grade 13 marks and interests, using both standard prediction and differential prediction. The basic instruments were a biographical questionnaire, the Preliminary Scholastic Aptitude Test (PSAT) and a carefully constructed interest instrument, the Academic Interest Measures (AIM). Both twelfth and thirteenth grade interests were predicted about as well by simple eleventh grade (or twelfth grade) ratings of interest in various subjects as by AIM. The simple ratings of interests also provided somewhat higher differential validities in both followup periods. Another simple item—ratings of occupational values—discriminated among intended major field groups that were not well differentiated in a discriminant analysis by PSAT and AIM.

Norris and Katz also factor analyzed their measures and found:

"The factor structure of interests remained remarkably consistent across different measures, across different groups, and across different times. Thus, the structure of interests was very similar whether AIM or students own ratings of interests were used; whether the group was composed of male or female enrollees in two-year or four-year colleges, or high school graduates who were not enrolled in any educational institution; whether the interests were measured in grade 11 or grade 13." (p. 157)

Thus, the basic structure of the student's ratings of interests was quite similar to the structure of the interest tests, suggesting that they assess the same psychological domain.

Norris and Katz also found that student-rated interests were just as valid as AIM in predicting grade 12 or 13 grades, although neither added very much to multiple correlations that included the PSAT scores. They conclude:

"In short, this extension to occupational interests of the network of relationships among AIM scores obtained in grade 11 and ratings of interests in grades 11, 12 and 13 suggested that interests occupy a rather well integrated and coherent territory in individuals' self-concepts. It is perhaps this very integrity and coherence of interests that has made simple ratings of academic interests just as valid predictors as the full AIM scales of every criterion used in the study. For use in prediction, anything AIM can do, SI (self-ratings of interests) can do faster. For use as a criterion measure as recommended in Part I, AIM retains a number of advantages." (pp. 158-159)

This study illustrates several important points about biographical variables. As in many other studies, much greater attention was given to the development of the scaled instrument than to the simple self-estimates. In many studies, this relative emphasis has tended to pit carefully constructed scale scores against rather haphazardly

written questionnaire items that are often included as an afterthought. It is therefore surprising that the biographical items do as well as most of the tests. The second point is that apparently simple information can tap the structure of psychological domains about as well as tests, as Norris and Katz found. If the structure of a psychological domain is not coherent and well integrated, it is unlikely that either simple self-estimates or tests will find it. If a characteristic is not an important part of a domain, it probably will have few correlates with other variables. If it is important, it should have numerous correlates, and, it seems probable, should be assessable by relatively simple self-reports or simple estimates.

In sum, the evidence leads one to conclude, with Dolliver (1969), Whitney (1969), and Holland and Lutz (1968), that there seems no justification for the long-standing bias against expressed choice in favor of tests. The practical implications of this conclusion will be discussed later in this section.

Apart from their comparative validity, how predictive are expressed choices? Whitney's recent review (1969) of this question, previously cited, brings together the relevant evidence from the large scale longitudinal studies ($N > 3{,}000$) that bear on expressed choice (the Strong study and the two Cooley studies have already been mentioned). A large study of college graduates conducted by the National Science Foundation (1963) found that, for 32 occupations, the median percentage of graduates employed or teaching in the area of their major field two years later was 40 percent for men and 29 percent for women. The majors varied greatly in stability from 91 percent in pharmacy for men and 91 percent in education for women to 4 percent in philosophy for men and two percent in religion for women. In contrast, Sharp and Krasnegor (1966) followed another large sample of college graduates, and found that 74 percent of the men and 83 percent of the women were employed in their major field area five years after graduation. The discrepancy in these results probably results from the smaller number of categories used by Sharp and Krasnegor. Rather than the individual majors used by the National Science Foundation, they used nine groups of majors—e.g., humanities and arts, health, natural science, etc. Thus, the postgraduate careers of college graduates seem to be fairly stable. These figures agree reasonably well with those developed by Slocum (1974) for professional, technical, and managerial workers. (However, jobs based on less education generally are less stable.)

Studies by Flanagan, et al. (1966) indicated that vocational choice gradually seemed to become more stable as students progressed through high school. (Theories of vocational development such as Super's, and Rosenberg's would predict such a result, of course). The average consistency for 30 listed occupations in the twelfth grade when compared to those listed one year later was only 28 percent for men and 40 percent for women. However, as reported earlier, Cooley's study of the same data divided these occupations into six categories and found a 54 percent stability over the four years of high school.

Using another research strategy at the college level, Astin and Panos (1969) studied the vocational choices of 3,821 subjects over four years of college. They grouped 40 career choices into 12 categories, and developed multiple correlations to predict final career choice from a wide variety of biographical information. The correlations ranged from .23 to .53. Freshman expressed choice was the best predictor for seven categories and second best for the remaining five. (Major field choice was the best predictor for three of those categories, degree goal for two, and sex for one.) The results of these varied studies suggest that self-expressed choice becomes a better and more stable predictor of vocational behavior as people become older. The results also suggest that the predictive power of expressed choice varies with

the number and appropriateness of the categories used to classify choices.

Classification systems

Various classifications were used in the studies just reviewed with various rationales. Usually, they were "eyeball" classifications based on assumed similarity. In contrast to these classifications, Roe (Roe, et al., 1966) and Holland (1966) have developed classification systems based on psychological analyses of vocational behavior. In these systems, when individuals change their vocational choices, they are predicted to change to psychologically related classes. Thus, changes are evaluated according to their conformity to theoretical expectations. In both systems, relatively direct and simple explanations are provided for the vocational behavior under consideration. Roe et al. (1966), using Roe's eight category scheme to study the patterns of movement when men change jobs, found that 68 percent moved to jobs in the same major group. Other moves were most often to related categories. Subsequent studies by Hutchinson and Roe (1968), by Osipow (1968), and by Roe and Hutchinson (1969), have indicated that the Roe System reflects the nonrandom nature of occupational behavior, and that the probability of movement from one group to another varies directly with the psychological nearness of one group to another. (Meir, 1970, has recently suggested an alternate to the Roe System that he believes will improve its predictions).

Holland's system explains changes a similar way: movement is to psychologically related classes (Holland, 1966, 1973). Holland's theory is based on a six-fold typology of vocational choices: *Realistic* type or technical, skilled trades, and some engineering fields; *Intellectual* or scientific and some technical fields; *Artistic* or artistic, musical and literary fields; *Social* or educational and social welfare fields; *Enterprising* or managerial and sales fields; and *Conventional* or office and clerical fields. Originally tested through a variety of studies at National Merit Corporation, Holland's system has also been applied to samples of typical college students (Holland and Lutz, 1968; Holland and Whitney, 1968). These studies showed the system to be reasonably efficient, at least over the period from application to college to the end of the first year of college. Holland and Whitney (1968) found that 69 percent of the men's choices were in the same major class over that period, with another 10 percent in a theory-defined "closely related" subgroup in a related major class. Comparable figures for women were 84 percent and nine percent. However, as Whitney (1969) notes, although this "proportion of correct predictions is promising, . . . the followup period was short and the criterion employed was expressed choice, and not actual employment."

Holland (1973) has clearly explained the development and rationale of his system, and has presented extensive evidence for its validity in more than a hundred studies. One of these is particularly important.

"Holland, Sorensen, Clark, Nafziger, and Blum (1973) applied the intermediate form of the classification to a national sample of retrospective work histories (N = 973) to test the predictive efficiency of the classification and related hypotheses from Holland's theory of careers. Analyses were performed by organizing and reorganizing the work histories according to the classification.

"The classification appears to order lower-level occupational histories in an efficient way, well beyond chance. Over five- and ten-year intervals, 6 x 6 tables show that the percentages of people remaining in the same main categories are 77.3 and 74.2. Other analyses imply that all three letters in an occupational code have predictive validity. Still other hypotheses from the theory reveal that the "consistency" of a man's initial occupational code forecasts both his level of achievement and his tendency to change occupational categories. Last, a man's level of education, income, and prestige is predictable from his ini-

tial occupational code in accordance with the hypotheses about education and vocational achievement. All such analyses were statistically significant and usually substantial in size." (p. 80)

Holland and Gottfredson (1974) studied the psychological meaning and predictive value of an individual's vocational aspirations by applying Holland's typology to the vocational aspirations of four samples: high school juniors, college juniors, employed adults, and a sample of college freshmen followed up a year later. The basic data consisted of the vocational daydreams reported in Holland's *Self Directed Search* (Holland, 1971). Answers to three questions were sought: Do a person's current and retrospective vocational aspirations possess psychological coherence or are they unrelated to each other? Does the degree of coherence among a person's vocational aspirations have any psychological meaning? Can a person's vocational aspirations be coded and summarized to yield an efficient index of future vocational aspirations? It was found that vocational aspirations, categorized according to the theory, were at least as efficient as interest scales and were often considerably more efficient in the prediction of later aspirations or choices. They also found that the more closely related were an individual's aspirations for several vocations, the more predictive they were of subsequent vocational aspirations, and the better the individual scored on a decision-making task. This study shows that vocational aspirations can add to the understanding of vocational choices when they are organized into theory-based categories.

Probably the most convincing demonstration of the predictive power of categorical systems is McLaughlin and Tiedeman's (1974) comparison of the hit-rates of the Holland, Roe, and Flanagan occupational classification systems in predicting career areas one, five and 11 years after high school. Following up the 1960 Project TALENT sample in 1961, 1965, and 1971, the authors examined the change and stability in the sample's occupational choices and career occupations. The classification systems correctly placed many more individuals than would be expected by chance. As the individuals become more and more involved in the actual world of work, their choices and activities become more and more stable. For example, the high school senior occupational choices were in exactly the same Holland category as were the actual occupations pursued one year later in 57.8 percent of the cases, the actual occupation five years later in 44.7 percent of the cases, and actual occupation eleven years later in 38.6 percent of the cases. (All of the percentages reported here are taken from the Holland system because it was the most effective system in every comparison.) Individuals in one occupation in 1961 were in an occupation in the same category four years later in 55.9 percent of the cases, and ten years later in 46.4 percent of the cases. Finally, individuals in an occupation in 1965 were in an occupation in the same category six years later in 63.3 percent of the cases. The analyses of the systems provided additional information about the choice process. Most of the changes in occupational categories were to adjacent categories in the systems; few changes were to categories far removed from the original ones. For example, it was much more likely that a draftsman would become an electronics technician than a life insurance agent. The authors also found a general tendency for a movement away from intellectual careers to careers in business and sales. This study, when considered in conjunction with Richards' (1970) results, also based on Project TALENT data, indicates that when the choices are grouped into theory-based categories of vocations, self-reports of vocational choices are more predictive of later choices and careers than is test information.

The results of these studies suggest a number of possible practical actions. First, students might be sent the results of their questionnaires and test results with guidelines for examining the con-

gruency between their own interests, abilities, and psychological resources and the characteristics of people currently in their field of choice, as well as with the requirements of their field of training or vocation. Perhaps general "congruency scores" could aid this effort. Students could also be guided to small-package "libraries" of vocational and educational information that would describe the characteristics of people in the field as well as the requirements for the field. Self-classification schemes of the sort reviewed in Section VII, could be used. Students would group their characteristics and interests into classes and investigate the occupations within the occupational classes congruent with them. In addition, by using such results in combination with classifications, a counselor could use students' tentative choices and their histories of choices to guide them to relevant materials, and to diagnose occupational conflicts. Undecided students or students unable to make up their minds, could also roughly classify their own interests and characteristics and study the occupations in the class congruent with them. An undecided student could also be encouraged to study the entire classification. The possibility of using biographical information to locate people for particular fields has already been suggested. A national center for storage and dissemination of information would be needed to do it effectively.

The research reviewed here provides a good deal of information; but clearly more information, research, and integration of research is needed, as well as dissemination of that information and its incorporation in practice. In general, these classification schemes, which are simple to apply and inexpensive, seem to offer a promise of improving prediction and understanding of vocational choice—something that simple expressed choice alone and most interest tests do not do.

The use of biographical information for understanding vocational choice

There have been many studies of the correlates and determinates of vocational choice (reviewed in Crite's voluminous and comprehensive *Vocational Psychology*). These studies have led several psychologists to develop theories of career development (five theories are summarized and evaluated by Osipow, 1968). Several of these theories particularly emphasize biographical variables in the development of vocational interests.

Roe (1956, 1964), for example, has particularly emphasized the influence of child rearing practices and early experience on vocational selection. Grigg (1959) and Hagen (1960) concluded that their studies of students did not support Roe's particular hypothesis that a warmth-cold dimension in childhood exerts an influence on the later choice of a vocation. Utton (1962) also did not find evidence to support Roe's idea. Switzer, Grigg, Miller, and Young (1962) did find relations between students' vocational choices and childhood experiences, but in the opposite direction from Roe's prediction. Roe and Siegelman (1964), in contrast, did find evidence that the amount of early social experience was related to the amount of later interest in people. They also point out that other background factors, such as socioeconomic background and education, as well as abilities, play a role in the choice of a specific vocation.

Holland (1961, 1962, 1963) has also studied parental influences on vocational choices. In early studies, Holland (1962, 1963) found that some parental attitudes were related to some of his groups of vocational choices. For example, mothers of students with *Conventional* choices had more authoritarian attitudes. Fathers of boys in the *Intellectual* category valued their childrens' curiosity, whereas fathers of boys in the *Conventional* category hoped their sons would be "happy and well adjusted." These results are generally plausible and tend to suggest that the

origin of interests is related more to parental values and interests than to specific child-rearing practices, although many parental values will probably influence parent-child relationships in subtle and complex ways.

Holland (1963, 1964, 1968) has also found that a variety of self-ratings, life goals, hobbies, extracurricular activities, and creative accomplishments had logical relations with the types of choice. Holland (1968) found that, in general, the same attributes that distinguished between the six types also distinguished between students within the main types who had different secondary interests. In this study, Holland also found that when both the first and second initial vocational choices of students were in the same category, their choices were more stable over a year of college than were those of students whose choices were in different categories. In related research, Holland and Nichols (1964) found that remaining in a field is associated with the possession of attributes similar to those of the typical student in the field. Holland (1973) has summarized other research on the development of vocational dispositions.

Although research based on the approach of Ginsburg and his associates (1951) has not used biographical information extensively, the general ideas of their approach could be used to categorize some biographical variables. Ginsburg assumes three general periods: the fantasy period, comprising the period when children have no basis in facts for their ideas, and imagine many careers; the tentative period, when children explore their own interests, abilities, and enjoyment of various kinds of activities; and the realistic period, when students try out various possibilities and finally crystallize their choices in a specific vocational pattern.

Super and his colleagues (1957, 1963) have developed a similar model, consisting of five substages of vocational behavior: tentative choice substage; transition substage; trial substage; trial and stabilization substage; and advancement substage. Super (1963) also outlines five vocational developmental tasks: crystallizing a vocational preference; specifying a vocational preference; implementing a vocational preference; stabilizing in a vocation; and consolidating status and advancing in a vocation. Super, Kowalski, and Gotkin (1970) have presented evidence that such variables as social status, grades, and participation in school and community activities predict later vocational choice. Of course, Super's emphasis on the development of self-concept and its relationship to vocational decision and his emphasis on the development of vocational maturity are closely aligned to developmental aspects of vocational choice. Many of the studies Super reviews are related to biographical information, although Super does not present them in this light. Norton (1971) reviewed the research on vocational development up to the time of his writing, and presents a number of additional studies that are related to biographical assessment.

In summary, there is a considerable body of literature that demonstrates the importance of biographical variables in vocational development, many of which can be assessed by relatively simple self-reports.

Prediction of vocational success

Biographical and self-descriptive information has been related to success in a variety of occupations. (The research on creativity in occupational settings was reviewed in Section III.) The general approach taken in most studies has been essentially empirical. Typically, as described by Baehr and Williams (1968), the general procedure is to administer a biographical questionnaire to a group of applicants or job holders. Then the discrimination power of each item in predicting some criterion of success in the occupation is determined. The items that discriminate are finally combined into a score, which is used to cross-

validate the results in another similar sample. In general, this approach or similar approaches with greater or lesser sophistication, has been used to predict two kinds of criteria: attrition, turnover, and tenure; and ratings of effectiveness or success and criteria of performance. It is not the purpose here to review all the work in the area but some representative studies may be mentioned.

Attrition, turnover, and tenure. Employers are naturally concerned with reducing attrition and turnover, and increasing tenure. If they could eliminate people who are likely to leave their companies they could reduce personnel costs considerably. It may be useful for colleges to study this area, since it has many parallels with the problems of reducing the dropout rate in colleges.

Schuh (1967) reviewed hundreds of studies of employee tenure and found 21 that related biographical data to tenure. In general, biographical information predicted tenure well. England (1971) has also reported good results in the studies of tenure as related to biographical information collected from weighted application blanks. Some of these studies may be mentioned as examples. In one study, Mosel and Wade (1951) were able to predict job tenure among department store clerks with a biographical inventory. In a cross-validation sample, the scale correlated .41 with job tenure, and the authors suggested tentative cutting scores on the scale that might be used to increase tenure. Dunnette, Kirchner, Erikson, and Banas (1960) were able to predict tenure (using tetrachoric correlations) among female office workers with correlations of .74, .61, and .38 over one, two, and three years. Whether or not this decline in correlation is a result of sample attrition and increased homogeneity, it suggests that the optimal weighting of biographical responses should be reviewed every few years to be sure that the best prediction is made. The authors also found a correlation of .73 for keypunch operators. In another industrial setting, American Oil Company (1962) estimated that they could reduce turnover among office workers from 53 percent to 38 percent by use of biographical variables. Fleishman and Berniger (1960) were able to predict tenure among secretarial and clerical women workers in a cross-validation sample with correlations of .77 and .57, respectively. The key misclassified only 22 percent of the short tenure group. Shott, Albright, and Glennon (1963) found similar results in samples of male and female workers. Buel (1964), was able to predict turnover with a correlation of .33. More recent studies obtained similar results, as reviewed by Schuh (1967) and England (1971). However, one serious need is to revalidate the weightings every few years because the nature of the criteria, the situation, and the applicant group can change. Schwab and Oliver (1974), for example, presented the results of four studies that had originally used weighted biographical data to predict tenure with original correlations running from .37 to .66. In a cross-validation four years later, however, no correlation was higher than .10. This suggests the importance of cross-validation and revalidation.

Proficiency ratings and performance criteria. In many studies, biographical information about individual's personal histories predicted ratings of proficiency and success. For example, Cureton (see Henry, 1965) commented that the single item "Did you ever build a model airplane that flew?" predicted rated success in flight training during World War II almost as well as the entire Air Force battery of tests. Asher (1972) has reviewed the relative predictive power of biographical or personal data compared to intelligence, ability, aptitude, and personality tests. He summarized the results of the many studies analyzed earlier by Ghiselli (1966) and Ghiselli and Barthol (1953). Biographical or personal data were clearly better predictors of job proficiency in a wide variety of settings. Asher explains the results as due to: the fact that biographical data includes systematic, comprehensive factual information about an in-

dividual; the items selected for biographical forms are more relevant to the criterion than other variables; and the items refer to behaviors that have a point-to-point correspondence with the criterion, as, for example, high school grades have to college grades. (In some cases, the point-to-point correspondence may be artifactual, since the same measures of content are used. Thus, it may be unclear whether there is continuity of behavior or simply consistency in response.) The superiority of biographical data is particularly impressive when some of the complexities of criteria and diversity of groups are considered. Ratings of success have many psychometric difficulties, but are often the most practical criteria for many roles which are multifaceted, or have few observable criteria of success. For example, Kirkpatrick (1960) used ratings of the overall job performance of Chamber of Commerce executives, and found that items in a biographical questionnaire dealing with education, extracurricular activities, employment records, etc., were related to this criterion. In a cross-validation an extraordinarily high correlation of .81 was obtained. Lockwood and Parsons (1960) were able to predict ratings of supervisory effectiveness in a cross-validation sample with a correlation of .53. In a sample of airmen, Harding and Bottenberg (1961) correlated biographical and attitude variables with absences, ratings, and rankings of performance, with correlations of .38, .43, and .41 respectively.

Real life criteria of success are difficult to construct in many fields, either because "success" is so complicated, or because success is based on many intangibles. Perhaps these difficulties explain the fact that the majority of industrial studies have been of sales occupations, where the criteria is often measurable in dollars. The general complications in this area are indicated by a recent study by Baehr and Williams (1968). They used scores on a biographical inventory based on an earlier factor analysis. These factored scores were correlated with five criteria. The multiple correlations with each criteria were as follows: with paired-comparison performance ratings .42; with mean sales volume .50; maximum sales volume rank .30; route difficulty .27; and tenure as a salesman .30. These correlations sometimes included some unexpected results. For example, tenure was negatively related to vocational satisfaction. The authors explain this as due to the older salesmen who were resigned to the occupation, rather than satisfied with it.

The usefulness and validity of biographical information in industrial and organizational decisions seems to be solidly documented. Biographical information seems to predict criteria that are complex and multifaceted with equal or better success than more time-consuming tests.

Section VI: Requirements of an effective brief-assessment system

This section is concerned with the various technical, statistical, operational, and theoretical requirements of effective systems of assessment based on brief assessments.

Psychometric requirements

The psychometric requirements of information provided by biographical questionnaires vary with the uses to which the information is put. The requirements are minimal when questionnaires are used as brief screening devices, for example in locating students who say they will need further help in particular subject areas. At more complex levels, the traditional psychometric standards are difficult to apply to biographical questionnaires. For example, as discussed in Section V, a student's self-expressed vocational choice may not be highly reliable in itself, but, as part of a typology and theory of vocational choices, it can be a good predictor of later vocational behavior. Thus, an evaluation of self-expressed choice on psychometric grounds must include an evaluation of theories and typologies as well as single responses. It is necessary to extend and revise traditional standards to evaluate these kinds of innovative approaches. Given these restrictions in the construction of self report instruments, however, many traditional measurement criteria can still be applied. (This discussion uses the general categories of Robinson, Rush, and Rush, 1968.)

Item construction criteria: proper sampling of content. Brief-assessment measures should meet this criterion, both in overall content and in specific items. For example, a questionnaire designed to be used in college admissions work should include items reflecting the major concerns of students, schools, colleges, and other parties concerned with college admissions. In addition, each item should accurately obtain the information necessary for the decisions for which the item will be used. For example, an item concerned with a student's requests for assistance from his college that did not include "assistance in finding part-time employment" would be incomplete. Of course, the items selected should be chosen after a careful review of earlier studies, and they should be pilot tested, and retained only if they were as varied and useful as assumed. (Factor analyses of biographical information, such as those conducted by Freeberg and Rock, 1969, may be useful for this purpose by suggesting important variables that should be contained in the instrument in order to achieve scale independence and coherence.)

Simplicity and clarity of item wording. This criterion is especially critical in brief-assessment measures because in many instances, individual items must stand by themselves as pieces of information. In contrast, a lengthy scale can include many items with marginal relations to the

content of the scale, but which, when taken as a whole, add to the total coverage of the scale. Individual items in biographical and self-report questionnaires must usually be directed exactly to the point; any subtlety of wording or hidden purpose usually will add to misinterpretation and increase the error variance. This is not to say that the items should not be constructed with care and attention to the subtle nuances of words; just the opposite. To use a classical example, Centers (1949) was skeptical about the large percentage of people in a survey who said they were "middle class" when asked to place themselves in the lower, middle, or upper class. He simply added the additional category "working class" and found that the majority of those who had previously identified themselves as "middle class" now identified themselves as "working class." These people had not wished to call themselves "lower class" because they felt that designation had moral and cultural connotations in addition to an economic meaning. In addition, the questions should not be offensive, unpleasant, or threatening to any of the groups using the instrument. This guideline should be followed cautiously, since it is probably impossible to develop an item that no one would find offensive. At a minimum, the items should be reviewed by representatives of the groups that would be using it. For example, a broad-band questionnaire for college admissions should be reviewed by students of different ability levels, interests, backgrounds, and ethnic groups. Consideration should also be given to differences in age and sex. When the instrument is administered, the groups should be told the purpose of the instrument and how its information would be used.

Asher (1972) has recently summarized a good deal of earlier work in an article entitled, "The Biographical Item: Can It Be Improved?" He notes the four rules developed by Owens, Glennon, and Albright (1966) for writing items that will be stable: be brief; wherever possible express the options in numbers; write the options to include all alternatives, or, if this is not possible, provide an "escape" option; give the items a neutral or pleasant connotation. Owens also suggested that items should not ask for information beyond the memory of the respondent, that statements be positively worded, and that responses should not be defined in qualitative terms, such as "seldom," "occasionally," and "frequently." (Asher also discusses other aspects of writing biographical items including a number of suggestions for future research.)

These principles appear obvious, but are often difficult to implement. Clarity, directness, and simplicity are difficult to obtain, but should be sought as goals. As Kuder (1970) concludes:

"A person who follows these principles should not be surprised if he produces a deceptively simple questionnaire which looks like something a junior high school student might have thrown together on a rainy Saturday afternoon. That's the way it *should* look!" (p. 225)

Item analysis. When items are grouped into scales, they can be subject to examination by traditional item analysis techniques: item intercorrelations, item discrimination analyses, and especially the correlations of the items with external criteria (item validities). Individual items, however, are more difficult to evaluate. The evaluation tends to be based on the extent to which the item discriminates among criterion groups, its correlates with criterion variables, and its relations to other kinds of information, including other biographical items or other tests designed to measure the same variables.

Scale construction. Most of the considerations in constructing biographical and self-report measures are similar to those in the construction of achievement and attitude scales (e.g., Lindquist, 1951; Adkins, 1974). However, two related problems are particularly important in biographical self-report measures: scale keying and scaling. Biographical self-report scales may cover an un-

usually wide area of content and are consequently difficult to key. For example, a composite scale of the educational stimulation of the home might include items on the existence of art supplies, globes, microscopes, or tape-recording equipment in the home; the number of books in the library and the number of magazines and newspapers to which the family subscribed; the attitudes toward education held by the parents; the neighborhood context, etc. It is difficult to make any a priori judgments about the relative importance of these specifics for general educational stimulation. Even when item statistics might indicate that such items form a statistically coherent scale, care needs to be taken that conceptually and empirically distinct concepts are not merged into a scale that would be too heterogenous to be useful. The technical problems in scaling biographical self-report scales are fairly straightforward. However, there are several conceptual problems. For example, a scale for the prediction of accomplishment may include private, unverifiable, and fairly low-level accomplishments—for example, writing a short story on one's own; public, verifiable, but fairly low-level accomplishments—such as writing a short story for a writing class; private, difficult to verify accomplishments of a fairly high level—for example, writing a novel that was not accepted by a publisher; public, and verifiable accomplishments, of varying levels—for example, winning a school or college prize for writing; and public, verifiable, high level accomplishments (having a story published by a national magazine) and outstanding public accomplishments (winning a National Book Award prize). Although a scale of this type, based on these varied accomplishments, would assess a continuum of accomplishment, it is still possible that one applicant would have three low-level accomplishments in contrast to another applicant who would have one high-level accomplishment. Thus, scaling the levels of accomplishment needs to be done very carefully, and interpretive guides written to minimize the misuse of the information.

Control of response set: acquiescence and social desirability. The control of acquiescence can sometimes be a problem in brief-assessment instruments, although probably less frequently than in personality tests or opinion surveys. As in those measures, the constructor of brief-assessment devices must be concerned with the context of individual items, and the stems in the items. The constructor of a self-report instrument can lessen "social desirability" by trying, where it is appropriate to do so, to equate item stems for social desirability, and by the use of forced-choice item formats. Another approach is to develop a score based on the choice of socially desirable alternatives (e.g., following Smith's, 1967, procedure).

Since many biographical and self-report questionnaires are concerned with accomplishments and achievements, another control should be made for any tendencies for exaggeration. One way is to develop a scale of unusual accomplishments that are uncorrelated or negatively correlated, so that a person who claims many of these rare uncorrelated accomplishments is very probably exaggerating his accomplishments. (Holland and Richards, 1967, developed a scale of this kind to control for exaggeration of non-academic achievements.) The fakability of the items is a particularly important problem in biographical and self-report questionnaires as previously discussed in Section III. Since the items are designed to be simple, direct, and to the point, they are eminently fakable, particularly when their purpose is often quite transparent. Given these conditions, there seem to be few ways to reduce the fakability of the items. But there may be several ways to reduce the actual incidence of faking or distortion. And here, ironically, the very transparency of the items may be useful. Since the items often cover factual matters that can be checked, the respondent may feel that his responses will be checked with reality if he dis-

torts them. The instructions to the questionnaire could be written in such a way as to imply that unusual responses will be checked on.

The sample. It seems a truism to note that biographical and self-report questionnaires should be developed from a sample that is representative of the population in which the questionnaire is to be used. However, brief-assessment instruments have, in practice, been used in populations considerably different from the samples used to develop them. In addition, because of the seeming simplicity of biographical and self-report questionnaire items, questionnaires are sometimes developed on inadequate samples, and are invalidly generalized to a population of interest to the developer. Thus, biases are sometimes built into the items selected. Questionnaires to be used with very diverse groups, such as high school students, or college applicants should be drawn from developmental efforts based on a sample representing that diversity. The nature of this sample will influence the adequacy of the items asked and the way they are interpreted. For example, in a question about family income, the income categories useful in a sample of Ivy League students might not be appropriate for use with most college students.

Normative information. Detailed information about the groups used for norms is as important for biographical and self-report questionnaires as it is for norms for test scales. If items are to be used as basic information, then distributions of percentages choosing each alternative should be prepared for samples of each group that would be a major user of the instrument, and for each group that represents a criterion group. The mean, standard deviation, and distribution of scores for these groups on any scales developed in a brief-assessment instrument should also be reported.

Reliability. Traditional concepts of reliability apply to scales used in biographical and self-report questionnaires, but are generally difficult to apply to individual item measures. The exception is test-retest reliability, and even here the correlation formulas are not always applicable, since many items do not form "scales" in any sense. Rather, the basic point is whether respondents make the same choices in an item when the item is presented a second time (i.e., stability). However, even stability may be a problem. For example, family income or educational plans may actually change over a period. Various statistics could be used to estimate the extent of this consistency, but the extent to which these statistics produce an overall estimate of "reliability" as accurate or powerful as the more typical reliability estimates is questionable. Where scales are used, item-total scale relationships are indicative of reliability (internal consistency).

Homogeneity vs. heterogeneity. Since biographical and self-report questionnaires are generally designed to serve a number of purposes, some heterogeneity of content should be desired as well as expected. Individual scales should have internal homogeneity, however, and scales of biographical questionnaires should show factorial invariance over time (Freeberg and Rock, 1969).

Validity. The items and scales of biographical and self-report measures should be shown to discriminate among important groups and correlate with relevant criteria. They should also maintain their power of discrimination and validity in cross-validation samples. Special consideration should be given to validation of biographical and self-report questionnaires in situations similar to those in which they will be used in practice. For example, questionnaires developed for use in college admissions should be validated with a sample of applicants, in the kind of selection situation for which the questionnaire will be used, rather than in a sample of admitted students.

The review of literature in the previous sections illustrated the multiple uses of biographical and self-report questionnaires. The biographical and self-report information usually discriminated

among criterion groups as well as test information. In addition, the information discriminated among groups that have many characteristics in common; for example, between more and less creative Ph.D. chemists, matched for age and experience. Thus, the power of biographical and self-report information to distinguish relevant groups based on numerous performance characteristics seems well established. However, an effort should be made to insure the relevance and applicability of the criterion groups chosen, with special care taken to avoid generalizing from extreme groups. For example, information that distinguishes between English majors and shop metalworking majors at a two-year college should not be used as a general guide for distinguishing between transfer and occupational students. Similarly, information distinguishing between a single unselective local two-year college and a highly selective national university (for example, comparing San Jose City College and Stanford University) is an unreliable guide for guidance of most students in choosing a college.

The criterion. The criterion is the most important variable in all validation. The importance of the criterion to self-report measures is suggested by a book edited by W. W. Ronan and Erich Prien, *Perspectives on the Measurement of Human Performance* (1971). The book consists of reviews and readings concerning the criterion problem. The authors attempt to show that ". . . the problem is actually that of shifting research emphasis from individual differences (as in psychological tests) to understanding human performance in the 'real' world . . . the criterion, as an evaluative index of performance behavior, is really a subproblem in the field of understanding human performance . . . (and) the study of human performance, per se, has been a sadly neglected area of research, and, in consequence, future progress must include the shift in research mentioned above if any significant progress in performance prediction is to be accomplished." (p. v). They outline four basic problems: the variability or reliability of actual performance; the reliability of the observance of human performance; whether performance involves a single dimension or several dimensions, and, if several dimensions exist, how one may deal with the dimensions in practice; and how performance on the same task may be affected by being required in different situations—the problem of generalizability.

On the first point, the variability of performance, Fiske and Rice (1955) outlined three types of behavioral variability: spontaneous or random variability; systematic variability; and variability due to task differences. Other studies suggest that "people are performing to arrive at a rather limited outcome, but they get there using different performances or responses." (Ronan and Prien, p. 89). An argument can be made that biographical information about past accomplishments and experiences provides information about the typical performance in the past, rather than the maximal performance assessed by tests, and, in this sense, assesses the systematic variability of past performance. Biographical information can also provide data about the differences in the tasks and task situations in which the performance occurred.

Related to the second point on reliability of observation, Kipnis (1960) discussed the problems when ratings are used in situations where some extraneous value (salary or promotion) is dependent on the rating, including propinquity of the rater and ratee, social setting, expressions of criticism, and specific behaviors affecting ratings. Ronan and Prien (1971) suggest some things that might be done to improve the reliability of observation when these drawbacks are considered: recognize that almost every task has more than one dimension; seek facts that can be collected about a person, other than ratings; recognize that some may be assessable only by ratings.

Biographical and self-report information about past performance obviously provides data about

the variety of earlier behavior that may be relevant to current activities, as suggested in Section IV. It also provides many other relevant facts that may influence individuals' performance and ratings of their performance. It is often the only type of information analogous to the information collected by ratings. Thus, biographical and self-report information has considerable potential for matching observed performance, and, consequently, has potential as a source of predictor variables.

Dunnette (1963), in a discussion relevant to the Ronan and Prien's third issue, the dimensionality of performance, has emphasized that performance behavior needs to be thought of as a complex event that requires study before any predictive studies are conducted. A variety of studies have demonstrated the complexity of job performance even in ostensibly simple positions, chiefly by factor analysis. Often, the dimensions identified in job performance are negatively related. Unfortunately, most studies of performance are "one shot" affairs that do not build on previous research, and that are not replicated in subsequent research. Consequently, it is difficult to outline the important dimensions in performance in many areas, since there is no coherent pattern in the available research.

Biographical and self-report information seems to provide a better base of information about the variety and complexity of earlier performance and experiences than do most test batteries. The information collected can be "tailored" to reflect the important dimensions of the performance criteria, and the complexity of the real life criteria can be matched by information about similarly complex and relevant earlier performances and experiences.

Dunteman (1966) has conducted a provocative study that bears on Ronan and Prien's last issue, the influence of the situation on performance. Dunteman pointed out that:

"In recent years much theory and consequent research on organizational behavior has been evident. However, March and Simon (1958) point out that the writings about organizations are scattered and diverse, and that the literature discloses large discrepancies between hypotheses and evidence. The literature contains many assertions, often with little data to back them up. Research on this topic has traditionally been carried out through laboratory investigations, field experiments, and the intraorganizational approach. Although little laboratory research has been directed toward the investigation of industrial organizations per se, much laboratory research which has been conducted on small groups may be considered to have relevance to the process and perhaps particularly the unprogramed activities of groups that occur in formal organizations...

"Most of the current literature of research on real-life organizations has been provided by the intraorganizational approach. Such research typically involves the investigation of one or a small number of firms. The possibility of generalizing from such studies has been necessarily curtailed because there has been no sampling of organizations, of time periods, or control over the relevant organizational variables which would explain the circumstances under which relationships do or do not occur." (p. 300)

Dunteman found that organizational attributes and individual behavior in 234 industrial organizations were highly independent, and concludes that as more organizational variables are considered, original relationships among variables become altered and take on new significance. Similarly, Rock, Baird, and Linn (1972) found that college characteristics have an impact on the amount students learn, even when the students' initial characteristics are taken into account. Thus, the organizational context would seem to have a pervasive effect on performance and criteria.

Biographical and self-report information would seem to have considerable potential for obtaining information about the organizational context of

earlier performance. It could provide important data for moderator analysis and for understanding earlier performance. For example, Hackman, Wiggins, and Bass (1970) have found that information about the college a student attended was more useful than GRE scores and most grades for the prediction of graduate school performance six years after enrollment.

In short, information about earlier performance and contexts would seem to reflect the diversity and complexity of real-life criteria, since it is itself a record of real-life events.

Cronbach (1970) has emphasized that ". . . validation examines the soundness of all the interpretations of a test—descriptive and explanatory interpretations as well as situation-bound predictions." That is, tests, or any standardized information, can be used to produce a description of a person. This description has many implications that will bear on future decisions. "To validate a description is to answer the question: When persons are described in this way on the basis of these data, how much confidence can be placed in each of the implications of the description?" This approach to validity cuts two ways in its application to biographical variables. On one side, it can be said any assessment period is an artificial occasion for observation, used to predict subsequent observations in situations arising in the natural course of the person's work or schooling. In contrast to tests, biographical information measures obtain broad-based data about a person's behavior in similar "natural" situations from the past, and thus can provide relevant predictor information. Biographical information usually refers to typical performance, whereas tests often assess maximal performance. Furthermore, in contrast to tests that are samplings of behaviors or attitudes usually in a few narrow areas, biographical data are likely to assess large chunks of relevant past behavior and to include many diverse areas. Thus, biographical variables are often readily interpretable and can be extrapolated more directly to future behavior. For example, biographical data may be especially useful in assessing students' educational experiences and suggesting reasonable bases to explain their academic performance. In addition, since biographical and self-report information assess characteristics that are factorially complex, it is likely that it will provide predictors of similarly factorially complex criteria. Thus, for all these reasons, biographical and self-report information seems to have many properties that meet Cronbach's prescription for validation as explanation. However, some of the advantages just claimed must be viewed with caution, and this represents the other side of the argument. The very "interpretability" and "common sense" quality of biographical and self-report data may lead to misinterpretation of the predictive validities obtained in research. When "common sense" is incorrect, it leads to error. For example, most people think they know why rich and poor people differ, and how to interpret differences due to age but their ideas may be quite erroneous. The problem is due to the frequent error or exaggeration of these common sense interpretations. Thus, the task for researchers using biographical and self-report variables often is not just to establish a valid interpretation, but to correct the unwarranted interpretations that tend to arise. This frequently requires a great deal of substantive research into the nature of the particular variable, whether it be social class, sex, race, college attended, or whatever. Beyond the empirical research into what is true, theoretical constructs to aid understanding are required. All of this suggests that we need much more substantive research on the meaning of many biographical and self-report information variables before we can say they are highly valid in Cronbach's sense. However, many other biographical and self-report variables are reasonably valid in Cronbach's sense, and several important ones show equal or greater validity than comparable tests.

Program and technical requirements of a brief-assessment information system

Many of the technical requirements of brief-assessment systems have already been met by the College Entrance Examination Board, Educational Testing Service, and the American College Testing Program in their respective student information forms, but it is still useful to discuss those requirements. As with all other aspects, the requirements are determined by the uses to which the biographical and self-report data are put. A multipurpose system has, of course, multiple requirements. The first requirement is simplicity and clarity of format, so that the items can be answered easily and directly. A second requirement is rapid turnaround time, so that the student, college, or school can make use of the results in their decisions. These two requirements dictate the kind of data processing and scoring systems used, and bear on the next requirement—easily understood reporting services. The format of these reports will be different for different users, and each depends on certain backup systems. For example, in order to tell each user what the chances are that a particular student will earn at least a C average at a certain college, a previous prediction study must have been made. The data from this study should be fed into a central information system, where it can be the basis for processing student scores and information, and the results fed back to the various users. In addition to these kinds of processing programs, reporting programs are also needed—for example, assemblies of rosters and reports for counselors or agencies, summarization programs for colleges or other agencies that want profiles of groups of students, and so on. Then a system of interpretive materials must be written and distributed so that the reports can be understood and used most effectively. In addition, an ideal system would have several backup systems of student and institutional interpretative materials. For example, one system could consist of additional information, as in the College Locator System or a career-suggestor system, or guides to further information, for example, references to useful information about colleges and occupations. Another backup and self-report system could consist of well-validated tests that provide information for any other decisions that would remain, for example, a valid test of clerical aptitude that could be used for students reporting some interest and talent in clerical occupations. This system would provide students with a place to go, and materials to aid their thinking after they have received their score reports and prediction equations. All of these various requirements seem feasible, although the work and funds necessary may be very great.

The theoretical requirements of efficient systems of brief-assessment information

It is striking that virtually all studies using biographical and self-report information are strictly empirical, and that the great number of articles reviewed in the previous pages have led to very few theoretical statements. To some degree this lack of theory is due to the practical nature of the problems investigated. However, the most plausible reason for the lack of theory is the general low regard in which biographical and self-report variables are held by many theorists and researchers. Such variables appear to be simple, commonsensical, even banal. Since they are "obvious" they may well be overlooked as basic data for theoretical systems. Of course, biographical and self-report differences are indirectly used to test theories: for example, when students with different majors are expected to show certain traits, or when students reporting high grades are taken as a group of "high achievers" in a theory of achievement motivation. In general, however, there have been few systematic efforts to use biographical and self-report information as the basis of theories.

Of course, as the many useful applications of brief-assessment data reviewed in this monograph have shown, theories are not required for the practical use of biographical and self-report information. In this sense, brief measures are similar to most tests, which are also directed toward practical questions, and are often unrelated to theory. The major uses of both tests and biographical data, such as predicting grades, vocational choices, or supervisors' ratings, can be treated simply as empirical problems, and with considerable success. However, there are several good reasons to hope for more theoretical systems that are based on or can be applied to, biographical and self-report information. The most important reason for hope is that a brief assessment information system can be more efficient and effective if based on testable theoretical ideas, as the review of the prediction of vocational choice indicates. With previously verified theoretical constructs, it is possible to evaluate the results of a particular study or measure with greater success. For example, a theory of industrial creativity could help explain why a particular predictor did not work, and suggest other predictors that would be more efficient. A theory could also suggest variables or information that should be included in a system. A biographical and self-report information system can also take advantage of theoretical relations. For example, by postulating theoretical relations among types of vocational choices, a system could refer students with a tentative vocational choice to information about related choices. This example bears on another use of theory in biographical and self-report systems—suggesting appropriate actions for the recipients of the information generated by the system. For example, by using theory-based information, a counselor could select the most appropriate counseling technique to use with an underachieving bright student who comes for counseling. The counselor might choose between group counseling (since theory indicates the influence of the peer group on achievement motivation) or arranging success experiences (since theory suggests that self-concept and self-confidence have a strong influence on achievement). In addition, biographical and self-report information can help shape theory. Such data can provide the raw materials for a variety of theoretical approaches, and can test the validity of theory-based propositions.

Another way of suggesting the importance of theory for use with biographical and self-report data is to examine the role of theory in serving the general functions of brief-assessment information outlined in Section VII: (1) Theory can increase the chances that the broad-band information provided by brief-assessment measures includes the appropriate variables to insure that there will be no "gaps" in the spectrum of relevant information provided by the measures. (2) By insuring comprehensive and relevant coverage, theory can help make selection and placement decisions more nearly rational. Theory can suggest additional predictor variables and criteria that can help make the decisions more precise and relevant. In addition, theory can suggest variables that can be used for differential prediction or as moderators. (3) Theory applied to biographical and self-report information can be a powerful source of hypotheses for counseling and guidance and can suggest a wider range of appropriate techniques for counseling the client. (4) For the same reasons, students or others who work through a questionnaire, using it as a learning instrument, can be referred to the relevant materials or to reasonable options to enhance their self-knowledge. (5) Theories applied to students with special needs could suggest appropriate actions. (6) Helping colleges or other agencies in their planning and administrative activities conceivably could be aided by theory, but the application is yet to be shown. (7) As the examples discussed in this section suggest, theory could greatly aid a two-way system of information and action, by defining appropriate

assessment variables, developing relevant back-up systems and materials, and guiding the student or client to the most appropriate materials. (8) Finally, theory can help us understand the transition from high school to colleges and jobs, by suggesting the personal, social, and economic factors involved in ambition, educational achievement, and real-life accomplishment. In sum, it seems that theory could help biographical and self-report information systems fulfill many of their potential functions.

Of course, the potential contribution of theory to systems, as suggested in the last paragraph, depends on the actual construction of theories using brief-assessment data. Theories can be constructed from such data, as some of the examples in this monograph indicate. At a minimum, biographical and self-report data can be used in the first stage of inquiry for some theories to test out ideas. More precise testing of the ideas could be left to later well-validated instruments or experiments. Another use of biographical data is in the opposite direction. That is, ideas developed in the laboratory or with measures using small samples can be tested in broad scale samples using biographical and self-report questionnaires. There are at least three areas where the use of biographical self-report data seems to be leading to theoretical conceptions: creative achievement, educational aspirations and attainment, and assessing the stimulus qualities of the environment. If biographical and self-report information is viewed by researchers as better than "second-class data," more theoretical ideas may be expected.

Statistical methods appropriate for brief-assessment information

The problem of choosing the most appropriate statistical technique for the use of biographical and self-report data is a difficult one, because most data of this type consists of responses to categorical questions, which may have unusual distributions. Although there have been a number of recent developments in statistical techniques using categorical information (for example, Gocka, 1973; Rock, 1974; Werts and Linn, 1971), traditional (and the most powerful) methods depend on assumptions of normal, continuous variables. While some of these techniques are so robust that their assumptions need not be met to the last detail, many may be used only with great caution. The standard techniques of analyzing data involving proportions, categorical information, measures of association, and so on, are outlined in numerous sources.

Rather than repeat those descriptions, this section will be devoted to some topics that seem particularly relevant to biographical and self-report data: the use of factor analysis, multiple regression, canonical correlation, differential prediction and multiple absolute prediction, and the use of biographical variables as moderators.

Brief-assessment information and factor analysis. Factor analysis is a method that has attracted both passionate adherents and passionate detractors. Among the adherents there are continuing controversies concerning the proper rotation techniques, estimates of communalities, etc. These controversies are beyond the scope of this monograph, but they have consequences for the interpretation of factors and the ways the data can be arranged and rearranged. With some limitations, it is possible to obtain results much in line with those the factor analyst expects. One analyst may come to solutions quite different from those of another using the same data, and the factor solution is directly dependent on the number and variety of variables that constitute the input data. For these reasons, factor analysis must be used with considerable caution.

Factor analysis should be used with special care with biographical and self-report data, particularly when each item is supposed to serve a different purpose, as in broad-band assessments. In this case, many of the factors may have load-

ings on only a few items, and the common factors may account for relatively little of the variance. The specific factors may be the most valuable in the factorial makeup of the biographical questionnaire. As Cronbach (1970) has written:

"Too energetic a wielding of the scrub brush of parsimony scrapes away significant information. A baby leopard with his spots scrubbed off is no doubt a kitten, but saying that leopards have a high loading on the cat factor does not imply that one should discard the concept of leopard and take the kitten home for a pet."

In spite of the caveats outlined above, factor analysis can still be a useful beginning for devising stable biographical and self-report scales, particularly when the instrument is designed for a single purpose, such as predicting academic achievement or sales success (e.g., Baehr and Williams, 1967). In such analyses, a great number of items may be reduced to a much smaller number of the most coherent and important dimensions that can, in turn, suggest scales or new items to assess those dimensions. The results may also suggest interpretations of the factors that can lead to a rational as well as an empirical approach to describing the content area (Baehr and Williams, 1968). A rational interpretation may be especially critical when a longitudinal study is conducted, so that the biographical and self-report factors that are relatively invariant may be assessed; the relative strengths of the factors at each time may be determined; and changes in the factor structure may be described. Of course, the measures developed from the results of the analyses must be evaluated against external criteria. L[illegible]sections suggest some ways to do that.

Multiple regression and canonical correlation. Multiple regression is discussed briefly in many basic statistical texts. Multiple regression applied to biographical and self-report data has been widely used in industrial settings, and in a number of educational settings (e.g., Astin and Panos, 1969; Flanagan, et al., 1966). Here again, one must be cautious, because of the ways in which the statistical technique may be used. Multiple regression can both discover and obscure important relations. Interaction effects are especially tricky with multiple regression techniques.

Biographical and other self-report information can be useful for multiple prediction for several reasons. First, the variables often refer to variables that are similar to the criterion variables, for example, past grades predicting future grades, past sales volume predicting future sales volume, and so on. A practical advantage is that they can provide broadband assessment without using an elaborate testing battery. The multiple regression procedure can then select the combination from the diverse biographical variables that may lead to the most efficient prediction. The diversity of content may increase the correlation. Here, however, is one drawback of studies using biographical and self-report data—they have generally been extremely empirical, and the results predicting an outcome in one setting can often not be generalized to other settings. To some degree these failures in replication are due to differences in measures, samples, conditions, and so on, but much of the difficulty lies in the emphasis on empiricism itself. If there were more interpretation and attempts to state hypothesized reasons for a result, the findings of one study could be compared with those of another with some profit, and the similarities and differences in results could be understood and evaluated better.

When an overall assessment also includes test data, biographical and self-report information can be a source of suppressor variables, because this type of information assesses things that are factorially complex. That is, some biographical and self-report variables may involve variance not found in the criterion that is found in other predictors. In sum, biographical information may be quite useful in predicting a wide variety of outcomes with multiple regression, since brief-assessment data can include a great deal of non-test

information, not only assessing cognitive and non-cognitive psychological traits, but also assessing social and background variables.

A few studies have used a related technique: canonical correlation. This method begins with multiple predictors and multiple criteria (or any other two sets of variables) and attempts to find the linear combinations in each that will result in the maximum correlation between the two linear combinations. Canonical correlation is similar to factor analysis in this way: after one set of linear combinations is removed from the first-order correlation matrix, other sets of linear combinations can be removed from the residual correlation matrix. This feature of the technique shows the various ways in which the sets of variables are related. Canonical correlation, therefore, seems a highly useful way to examine the overall relations between theoretically related types of variables, such as interests and other personal traits. (For details of the method, see Cooley and Lohnes, 1971.) This method has been used in a few studies involving biographical and self-report data, e.g., Baird (1970). But if other methods must be interpreted with caution, canonical correlation warrants special caution. The weightings in the vectors may be due to specific variances or common variances. Sometimes the relations are so complex the researcher may face information overload and difficulties in interpretation. The canonical procedure sometimes suppresses some variables while maximizing others, and seems to be highly dependent on the variables included in each data set. Finally, the researcher must be sure that both sets consist of variables that can be represented meaningfully by vectors composed of additive combinations of separate elements. (See Gullahorn's 1967 discussion of her results.)

Differential prediction and multiple absolute prediction. The first of these two techniques developed by Horst (1954, 1955), has already been mentioned in Section I. In both methods the problem is to make the best decisions for maximizing performance on multiple criteria, using multiple predictors. In multiple differential prediction the solution sought is one that will find the performance area in which each person will do best. In multiple absolute prediction, the solution sought would seek a maximal performance for the entire sample on all criteria. Horst (1966) describes the two techniques as follows:

"In multiple differential prediction the problem is to use a set of multiple predictors to predict each of a number of different criteria. Here we wish to provide differential prediction so that, having estimated each one of a number of different criterion measures for each person in the sample on the basis of predictor measures, we can determine for which of the criterion measures the person might be best suited. The problem is to get predictions of success which will give maximum differentiation for the individuals with reference to the estimated criterion measures.

"The solution of the predictor selection problem assumes that we have a relatively large number of predictor measures, and that we wish to determine which of these measures should be selected so that when they are used with the appropriate prediction formulas, we will get maximum differentiation among the estimates of the criterion measures. These estimated criterion measures will provide a basis then for assigning each person, or for advising each person about the activity for which he may be best suited. . .

"Multiple absolute prediction of multiple criteria is slightly different from the model we have just discussed. . .

"The problem then is to select from a larger pool of potential predictor variables those which will give the highest sum of multiple correlations with the multiple criterion measures, regardless of the correlations among the predicted criterion variables. . .

"It should be noted that in general the formulas for the predictor selection in the multiple differential approach will not select the same pre-

dictors as in the case of the multiple absolute prediction approach. The latter approach will tend to select predictors which measure variance common to all the criterion variables, and will therefore cause correlation among the predicted criteria. On the other hand, for differential prediction the selection procedure tends to select those predictors which do not predict that variance which is common to the criterion measures." (pp. 361-362)

Lunneborg's fine statement of the case for the use of biographical information in multiple differential prediction was quoted in Section I. Much the same reasoning applies to multiple absolute predictors; that is, it is likely that biographical and self-assessment information will include variables related to the multiple criteria. Of course, both of these methods also require careful interpretation and replication of results.

The use of biographical and self-report variables as single and multiple moderators. Moderator research has attempted to find subgroups of individuals who are relatively homogeneous in terms of their predictability and/or for whom a predictor or set of regression weights are especially appropriate. Among the major approaches to the identification of moderator variables are the following: (1) Ghiselli's method which selects items that correlate most highly with the absolute difference between standardized predictor and criterion scores (Ghiselli, 1960a, 1960b, 1963). Using this approach, a scale can then be developed to predict the degree of correspondence between predictor and criterion variables expected for any person. Jorgenson (1970) has extended this logic to identify items that discriminated among groups whose criterion scores were predicted by one predictor better than by another. Jorgenson also identified items that discriminated between a group whose criterion scores were predicted well by a multiple regression equation, and a group whose scores were predicted poorly. The later scale added slightly to the multiple R. One drawback of scales developed using these methods is that they have generally not been interpreted, but simply used for empirical studies. Thus, when the utility of the scale in a new sample is less, there are no guidelines for understanding why, or for attempts to improve the scale. Of course this need not be the case and the investigator could at least try to characterize the content of the scale. Examining the correlation of the scale with other measures or factor analyzing the scale would also probably be useful. (2) A similar technique in which item responses are correlated with the difference between actual and predicted criterion scores has been used by England (1971). The scales developed by this method are then used as predictors in a multiple regression equation. Again, these scales tend to be atheoretical. (3) Berdie (1961, 1969a, 1969b), in his studies of intra-individual variability and predictability, has suggested that persons whose performances on tests are variable will also be less predictable than others. Variability itself seems to Berdie to be a generalized trait, a construct in its own right. Apparently it may be measured in many ways. Berdie has shown consistent but non-significant differences in R's between high variability and low variability students. However, his approach has also been basically empirical. If the construct of variability is to be supported, it needs much more evidence to validate it, and to show its relations to other traits, but Berdie's results are highly suggestive. (4) Finally, the search for scales or attributes, either single or multiple, that characterize more or less predictable people have been the main emphasis of the most active researchers in moderator research. Since this research is extensive, it is dealt with at greater length here.

The single moderator research has already been mentioned in Section I. While this research has led to many suggestive results, a more fruitful approach seems to be the use of multiple moderators (Rock, Barone, and Linn, 1967). From preliminary analyses, the researcher may hypothe-

size several variables that he thinks will have a moderating effect on the relationship between predictors and a criterion. The data on multiple moderators form an n-dimensional space. Using a procedure developed by Ward (1963) the method clusters the cases into groups based on their similarity to one another on the dimensions. Ward's technique begins with many groups, with only a few cases in each, and successively collapses the groups into fewer groups with more cases in each, and each group successively combined with the ones most similar to it until the researcher notices a large increment in the within-group sum of squares. The multiple regression predicting the criteria are calculated and compared in order to see if, in fact, the groupings based on the moderators led to different levels of prediction. As described by Flaugher and Rock (1969) the success of the grouping can be evaluated according to the degree it serves at least three purposes: whether it increases overall predictability across groups; whether it identifies groups that are most different in predictability; and whether it identifies groups that are most different in predicted and obtained scores on the criterion (the method has been used to study over- and under-prediction). The computer program that carries out the calculations for these methods can be altered to reach solutions that will meet each of the three functions just listed. Flaugher and Rock (1969) have used variants of this technique to study under- and over-achievement; Klein, Rock, and Evans (1968) to study academic achievement; and Rock, Baird, and Linn (1972) to study the relation between college characteristics and mean achievement on the Graduate Record Examination Area Tests. The results of these various studies are complex, but suggest that the method can profitably be applied to a wide variety of problems.

This brief discussion of moderator approaches does not do justice to the area, but two issues should still be discussed: the practical benefits of defining moderators and the particular contributions of biographical and self-report information to the area. For pure selection purposes, it would be highly useful to know which applicants were predictable, and which were not. The decision-maker could select more predictable persons or groups and simply eliminate the others, if there were a large applicant pool. He could also apply different selection ratios to people of different predictability, so that the probability of success would remain the same, simply raising the cutting scores as predictability declines. Another approach would be a sequential strategy, accepting those who were predictable and who had high predictor scores, and asking for more information from further assessments for those who were less predictable. Another potential advantage (more in principle than in practice) is the possibility of finding predictors that apply more to one group than to another. Understanding the differences in the pattern of predictors could, potentially, be of great substantive interest—for example, if men use abilities different from those of women in showing successful performance in executive positions. If moderators can isolate groups with different predictor patterns, a greater variety of predictors may be considered in initial assessment batteries. That is, a predictor may not be highly useful across an entire sample, but could still be useful for a particular subgroup identified by moderator analysis.

Again, the moderator analyses may make the basis for decision more apparent by identifying variables that influence predictability. For example, if a scale of psychopathology moderated prediction of success in sales, one might wish to reconsider his selection policies. The same kind of result might make one reconsider his criterion measure. Another stimulus for reconsidering a criterion would be when it was found to be highly predicted for a small subset of people, but poorly predicted for the majority of cases.

Moderator techniques can also be applied usefully to a variety of substantive problems, such as

under- and over-achievement (Flaugher and Rock, 1969) or under- and over-prediction (Hobart and Dunnette, 1967). In analyses of this type, it is important to remember the cautions of Zedeck (1971) and McNemar (1969). That is, a moderator may simply be correlated with differences on the criterion measure that stem from correct and over- or under-prediction. The analyses should control for that possibility. One of the most intriguing kinds of result is when the variables that indicate under-prediction or achievement are different from those that indicate over-prediction or achievement, that is, when the moderators do not operate in a linear manner. Another area of potential substantive value lies in the attempts to study variability per se, considering it as a psychological construct.

The value of biographical and self-report information, again, lies in its potential for broadband assessment. That is, it is probably more likely that a moderator that is uncorrelated with the criterion, but which influences the predictability of the criterion, will be found in a variety of biographical and self-report data, rather than in a test battery. In addition, biographical and self-report variables are generally easily interpretable, so that one may reach a clearer understanding of the reasons for their moderating effect. Biographical variables also often have social value, in the same way a widely agreed-upon criterion has social value, so one may evaluate the entire selection procedure in terms of who is selected and who is not with better understanding of why the result occurs. Biographical and self-report information also seems to provide unusual opportunities for learning more about criteria. For example, in the section on grades, the negative personal characteristics associated with grade-getting skill was described. A final advantage of biographical and self-report variables is that they can often have nonlinear relations as moderators, thus being especially useful in the under- and over-prediction design. For example, hypothetically one might find that high social class was associated with over-prediction, but that middle, rather than low, social class was associated with under-prediction.

Summary

This section has been devoted to a brief review of some techniques that can be used with brief assessment data. While a number of cautions were suggested for these techniques, some seem to be quite applicable to biographical and self-report data, and several would seem to take particular advantage of the potential of biographical and self-report information.

Section VII: Conclusions: The general functions of brief-assessment measures

The values of brief-assessment information include the breadth of its coverage, its utility in a variety of decision-making situations, its potential use as a learning experience, its ability to screen large numbers of people inexpensively and quickly, and the ease with which it is obtained.

Broadband assessment

Perhaps the most important contribution of brief-assessment information is that it provides broadband assessment of many variables, as demonstrated in this review. Cronbach and Gleser (1957) defined "broadband" assessment as assessment that attempts to give a rough answer to several questions rather than a precise answer to one or two questions. The greater breadth of broadband measures, however, has other costs. That is, the user of broadband assessment must confront the "bandwidth-fidelity dilemma," derived from Shannon's (1949) information theory. Bandwidth refers to the amount of complexity of information that a communicator tries to convey in a given space or time. The analogue for this in testing is the number of independent scores one tries to obtain from a given test or testing period. "Fidelity" refers to the accuracy and precision of a communication. Its analogue in testing is the extent to which a test accurately measures what it is supposed to measure. The dilemma occurs because, in general, any increase in bandwidth reduces fidelity; greater fidelity reduces bandwidth. The dilemma has led test constructors to favor the approach described by Cronbach (1970):

"The classical psychometric ideal is the instrument with high fidelity and low bandwidth. A college aptitude test tries to answer just one question with great accuracy. It concentrates its content in a narrow range using homogeneous items to increase reliability. Its parts are highly correlated, hence part scores give little information for choosing between majors or diagnosing weaknesses." (p. 181)

In contrast, the approach used in most brief-assessment instruments is to cover many variables; that is, to seek wide bandwidth. (The examination of the question of fidelity in the earlier sections of this review showed that there is considerable evidence that brief item information can have very good fidelity and also be part of an instrument with wide bandwidth.)

The broad band of information provided by brief-assessment may be particularly useful in several ways.

First, biographical questionnaires can easily include a variety of information directed toward a number of decisions of varying importance and complexity. If only a simple decision is to be made, there is no need for such broadband assessment. For example, colleges interested only in the

academic performance of admitted students may not be concerned with their values, personal or social adjustment, or probable careers after college. In contrast, many colleges are concerned with multiple outcomes and must make decisions in many areas. They need validated broadband information for such purposes as sectioning, counseling, choosing those who need remedial work, selecting among financial aid candidates, and for help in educational diagnosis. In addition, many educational decisions are multifaceted and require information on many aspects of the student, and this can be provided by brief assessment instruments more economically than by tests. Of course, each decision needs to be validated against subsequent outcomes.

Second, brief-assessment instruments can cover a broad band of information and can provide rough-to-good data for decisions that can be confirmed or changed at a later time, thereby increasing the efficiency of the assessment procedure. For example, a student who checks that he would like help with his reading skills on a questionnaire should not be sent automatically to a remedial reading class, but should be referred to the counseling center for testing of his reading level. Similarly, a student who checks that he would like to be considered for advanced placement in mathematics classes might be asked to take an examination prepared by the mathematics department. In these examples, it is clear that the questionnaire procedure is more efficient and less costly than giving all tests needed for all decisions to every entering student. Furthermore, the broadband information provided by the questionnaire served as the first stage in a two-stage decision process. In the second stage, the initial possible decision leads to a final decision based on high-fidelity measures. This role in sequential decisions may be among the most useful of the functions of brief-assessment instruments.

Finally, the broadband information provided by brief-assessment instruments can sometimes provide information about areas for which no present high-fidelity instrument exists, but in which it is necessary to make decisions. Even if the information provided by these instruments in these areas is of relatively poor quality, it has some value when there is no better basis for choice. Of course, the choices must be evaluated by later followup and feedback.

Selection and placement

The greatest contribution brief-assessment measures make to selection and placement is based on their capacity to provide broadband assessment, as just described. This broadband assessment can provide information about the multiple characteristics needed for success in complex roles. By providing additional information, biographical and self-report questionnaires can make the original selection-rejection decision a better decision. (The contribution this information makes to the prediction of college grades was reviewed in Section I.) The contribution of broadband questionnaire information may be especially valuable where the performance or decision is evaluated by multiple criteria. Of course, when multiple criteria are uncorrelated, or negatively correlated, it is difficult to develop a single selection strategy that will maximize a total payoff function, as illustrated by the study by Baird and Richards (1968).

Another advantage of brief-assessment procedures for selection purposes is their flexibility and diversity. They can be "tailored" for various decision situations more easily than can test batteries. The use of a "tailored" questionnaire must be confirmed by further evidence, of course.

Biographical and self-report questionnaires may be particularly useful for the decisions faced by two groups of colleges at opposite ends of the selectivity dimension. Highly selective colleges and universities face the problem of choosing from a large pool of equally well-qualified applicants. Biographical and self-report questionnaires can pro-

vide information about these students' nonacademic abilities, past successes, and educational experiences. This information can be used as one of the bases for selection. Open-door colleges, in contrast, face the problem of dealing with large numbers of students who are at many levels of academic preparation. For these colleges, brief-assessment instruments can be useful diagnostic devices; they may also be one of the few ways to meet the difficult administrative problems of assessing large numbers of students. For both kinds of colleges, differential or moderated prediction may be useful, as suggested in Sections I and VI.

Providing information for counseling and guidance

Brief assessments can provide counseling offices with indications of students' problems, and can be used to discover those students who most need assistance. Moreover, instruments of this type can be used by counselors to secure background information before meeting with a student and can help in choosing any additional tests the student might productively take. Tyler (1961) suggests several ways that "case records" can be used by counselors as aids—especially in reducing the amount of interview time that must be devoted to collecting factual information.

By providing simultaneous information about students' personal, social, and academic backgrounds, educational and vocational plans, financial needs, past accomplishments, attitudes toward their abilities, and so on, biographical and self-report instruments can be rich sources of hypotheses to counselors or guidance officers working with students. They enable counselors to examine specific consistencies or inconsistencies and conflicts in students' backgrounds, aspirations, and plans.

Serving as a teaching and guidance instrument for students completing the biographical questionnaire

Biographical and self-report questionnaires can, potentially, serve as teaching and guidance devices. By asking students to work through them conscientiously, students can be trained to notice the same kinds of consistencies and conflicts that a counselor would find important. This use of questionnaires presupposes some backup materials that help the student or client to ask appropriate questions about his own responses. Hahn (1969) has developed materials of this type for use with adults who wish to evaluate their own career objectives. These devices guide the adult to a critical examination of his own plans and characteristics. Holland (1971) has developed a system that helps students organize their occupational daydreams, activities, competencies, interests, and self-estimates into a pattern, which can then be compared with patterns of people in various groups of occupations. Computerized systems such as Katz's System for Interactive Guidance and Information are based on the same ideas. These systems illustrate some of the possible ways biographical and self-report questions can be used to help students examine their choices and consider new possibilities to explore.

A second way brief-assessment instruments can be used as teaching and self-guidance devices is by using items or groups of items that will inform students about options and requirements. For example, questions about what the student wants from his college could help the student reconsider his reasons for choosing colleges, and could help him consider more appropriate colleges. Similarly, a checklist of academic skills that includes items as, for example, "I can underline a textbook so that I can review the most important points later," could help students locate their academic weaknesses, and suggest specific skills they should develop.

Identifying students with particular characteristics or needs

The previous uses suggest how brief-assessment information could also be used to identify students with special characteristics or needs. Thus, students from minority groups who wish to avail themselves of programs designed especially for minority groups could indicate their interest by the relatively innocuous process of filling out an information blank. Similarly, students who wished assistance in numerous areas could alert their colleges to their needs. Students who simply desire information about particular college programs could also use the questionnaire as a way of communicating their interests to several colleges. In addition, colleges receiving a description of the educational needs of their incoming classes could prepare for them by, for example, creating a course in reading skills if a sufficient number of students indicated they needed this. Checklists for students who wish assistance or information from their college are part of both the College Board's Student Descriptive Questionnaire and the American College Testing Program's Student Profile Section.

Helping colleges in their planning and administrative activities

A systematic collection of biographical and planning information can be of great assistance in the day-to-day work of colleges. These data can form the basis of a student record system by providing common information for all students on a wide variety of variables. By assessing the extent of students' needs for financial aid, the distribution of probable majors, and so on, summaries of questionnaire data can help in budgetary planning. Summaries of students' needs and hopes about college can help colleges plan their orientation activities. Knowledge of students' plans for housing, commuting, and so forth can help colleges prepare for those aspects of student personnel work. Summaries of such information can also help in planning extracurricular activities as well as health services (Lutz, 1968). The College Board's Summary Reporting System and the American College Testing Program's Student Profile Service already provide much of this information. Breakdowns of summary data for special groups of students can help colleges prepare and plan for the needs of such groups as commuting students, men and women, older students, minority students and working students (Hoyt and Munday, 1968). By summarizing the characteristics and needs of these students, colleges can also avoid mistakes based on lack of information in working with these groups.

Providing the basis of two-way systems of information and action

By providing information about students to schools, colleges, and agencies, biographical and self-report information can form the basis for two-way systems of information. The first direction of flow of information is from students to institutions and agencies. Properly utilized, this information could help colleges locate students with characteristics the college values, as the College Board's Student Search Service does, and the colleges could send information about themselves to the students so identified. Of course, students have to agree to allow their names to be sent to interested colleges. Similar procedures could be used by programs and agencies interested in the recruitment of talent, such as national and state scholarship agencies. One example of this is the combined PSAT-National Merit examinations which have been taken by millions of students. These groups could then turn the flow of information back to the student, providing him with useful materials that could increase his options and widen his understanding of his choices. A central national agency could also be the source of general information that could aid the student and his counselors. As an information clearinghouse, the

national agency could provide career and occupational information about specific fields designated by the student, or could guide him to sources of information. If the student indicated that he wanted help in deciding about a vocation or career, he could also be guided to appropriate materials. Similar services could be available to students who are choosing a college: information about designated colleges, guidance to appropriate materials, information about how to choose a college, and so on. In addition, with enough information about the characteristics of students and their preferences for characteristics of colleges they might attend, a central agency could operate a college locator service. An ideal service would provide names and descriptions of colleges that fit the characteristics that students indicate are important to them, and that fit the characteristics of the student. For example, information about Yale would be of little value to most students with SAT scores of 400. The central agency could also be a clearinghouse for information directed toward specific educational needs, and could send materials to the student or guide him to materials on how to study in college, how to improve reading skills, guides to reviewing specific subjects, background reading for college, and living away from home.

Monitoring and understanding the transition from high school to schools, colleges, and jobs

Monitoring the flow of students from high school to various schools, colleges, and jobs is an important task for many reasons. It provides data that are essential to students, agencies, and institutions concerned with the flow of talent and the obstacles to that flow. Studies of manpower allocation, recruitment of talent, scholarship policies, and policies for minority groups all depend on information of this type. Biographical information can contribute to this monitoring by supplying data about socioeconomic background, academic preparation, work experience, geographic origin, educational background, and nonacademic accomplishments. A national program, gathering data about student characteristics, and obtaining data about the distribution of students to various programs, schools, jobs and fields would provide the basis for descriptively answering questions similar to these: "How do students finance their educations?" "What are the effects of scholarships and loans?" "What are the obstacles—educational, physical, and social—to further education?" "What kinds of students enter various fields?" "Why?" "What kinds of students enter various kinds of colleges?" "Why?" "What kinds of students may the small college hope to obtain?" "What kinds may the large college hope to obtain?" "How many minority students enter various programs, colleges, and jobs?" "Where and why do they enter?" "What are the problems faced by the disadvantaged and the poor?" "What is the plight of the middle classes?" "What happens to the 'undermotivated' and the 'overmotivated'?" Clearly, few of these descriptive questions could be answered by test data alone. The answers will probably change as society and education change. It is, therefore, important to monitor the changes continuously.

Biographical and self-report information may be particularly valuable in examining the flow of talent because it can broaden our conceptions of talent and talent loss. Although the terms "talent" and "talent loss" can be variously defined, educators and social scientists customarily have defined "talent" in terms of a single dimension—academic aptitude—usually measured by school grades or academic aptitude test scores. Those students scoring above a certain level are "talented," while the others, by implication, are "untalented." Any "talent loss" is the percentage of "talented" students who fail to attend college. This kind of definition appears eminently practical at first glance, but the practical advantages of definitions based on academic measures do not

justify their current popularity. As we have shown, academic measures are not efficient forecasters of a great range of talented performance. Before we can assess the degree of "talent loss" in even an approximate way, we need to know many things, some of which can be provided by biographical information. First, we need to describe the socially relevant outcomes that we hope "talent" will attain. We then need to know what kinds of human abilities are essential for the attainment of these outcomes, as well as the appropriate environmental and social conditions. Finally, we need to know which kinds of training programs best develop and train people with the required abilities so that they will attain the outcomes we value. Clearly, we must know much more and make many value judgments before we can speak accurately of "talent loss." Better judgments may be made when biographical and self-report information is available.

Conclusion

This section has suggested some of the potential uses of brief-assessment information. Biographical and self-report information seems to have great possibilities, especially when part of a systematic national information system. The previous sections examined the evidence for the validity and utility of brief-assessment variables for a number of purposes, the technical and statistical treatment of biographical and self-report variables, the psychometric and other requirements of useful biographical and self-report information systems, and the issues involved in the use of information of this type in various kinds of decisions.

Cronbach (1970) suggests that any attempt to add to traditional measures elicits a healthy conservative response. The conservative response led Cronbach to hope ". . . for benefits from each innovative proposal, since that is the only way progress in testing can come, while insisting that each proposal to increase bandwidth prove its merit. In particular, this means looking for evidence that each score added to the profile (and each difference between scores in the profile) is reasonably generalizable—and then going on to ask for evidence that such refined information relates to non-test variables." This review has indicated that direct information from questionnaire items is generalizable, useful for specific decisions, and related to non-test and non-questionnaire variables. The potential of information of this type may not yet have been tapped. Biographical and self-report questionnaire research has not received anything like the intellectual and financial support given to traditional tests. And, as this review has suggested, more systematic work needs to be done to examine and improve the utility and validity of biographical and self-report information. It seems that such work would be of value to the creators and users of test information. Finally, in considering the importance of biographical information for a complete description of an individual, it is instructive to note, as Dailey (1960) has, ". . . when a noted psychologist dies, the commemorative article describes his life and work—there is no case on record in which a journal published the test scores of a deceased scientist as an adequate description of him as a person."

Reference list

Introduction

Calahan, P. Correlates of respondent accuracy in the Denver Validity Study. *Public Opinion Quarterly*, 1968, *32*, 607-621.

Clausen, A. R. Response validity: Vote report. *Public Opinion Quarterly*, 1968, *32*, 588-606.

Freeberg, N. Personal communication, 1974.

Hardin, E., and Hershey, G. L. Accuracy of employee reports on changes in pay. *Journal of Applied Psychology*, 1960, *44*, 269-275.

Harris, H. J. The Cornell Selective Index – its use in psychiatric diagnosis. *Annals, New York Academy of Science*, 1946, *46*, 594-603.

Maxey, E. J., and Ormsby, V. J. The accuracy of self-report information collected on the ACT Test Battery: High school grades and items of nonacademic achievement. *ACT Research Report No. 45*. Iowa City, Iowa: Author, 1971.

Mosel, J. N., and Cozan, L. W. The accuracy of application blank work histories. *Journal of Applied Psychology*, 1952, *36*, 365-369.

Walker, K. P. Examining personal information items of a questionnaire study. *Journal of Educational Research*, 1937, *31*, 281-282.

Walsh, W. B. Validity of self-report. *Journal of Counseling Psychology*, 1967, *14*, 18-23.

Walsh, W. B. Validity of self-report: Another look. *Journal of Counseling Psychology*, 1968, *15*, 180-186.

Walsh, W. B. Self-report under socially undesirable and distortion conditions. *Journal of Counseling Psychology*, 1969, *16*, 569-574.

Section I

Abe, C., and Holland, J. L. A description of college freshmen: Students with different choices of major field. *ACT Research Report No. 3*, 1965a.

Abe, C., and Holland, J. L. A description of college freshmen: Students with different vocational choices. *ACT Research Report No. 4*, 1965b.

Abelson, R. P. Sex differences in predictability of college grades. *Educational and Psychological Measurement*, 1952, *12*, 638-644.

American College Testing Program. *Assessing students on the way to college*. Author, Iowa City, Iowa: 1973.

American Council on Education. National norms for entering college freshmen. Issued annually in the *ACE Research Reports* series. Washington, D. C.: American Council on Education, 1966-1975.

Armstrong, R., and Jensen, J. Report on Massachusetts State College study of SDQ student reported grades. Draft Report, 1974.

Astin, A. W. *Who goes where to college?* Chicago: Science Research Associates, 1965.

Astin, A. W., and Panos, R. J. *The educational and vocational development of college students*. Washington, D. C.: American Council on Education, 1969.

Baird, L. L. The prediction of accomplishment in college: An exploration of the process of achievement. *Journal of Counseling Psychology*, 1969a, *16*, 246-254.

Baird, L. L. Predicting grades in occupational and academic curricula in two-year colleges. *Journal of Educational Measurement*, 1969b, *6*, 247-254.

Baird, L. L. A review of studies of self-reported grades. Unpublished manuscript.

Bendig, A. W. Comparative validity of empirical temperament test keys in predicting student achievement in psychology. *Journal of Educational Research*, 1958, *51*, 34-38.

Bendig, A. W., and Sprague, J. L. The Guilford-Zimmerman Temperament Survey as a predictor of achievement level and achievement fluctuation in introductory psychology. *Journal of Applied Psychology*, 1954, *38*, 409-413.

Berdie, R. F. Intra-individual variability and predictability. *Educational and Psychological Measurement*, 1961, *21*, 663-676.

Biggs, D. A., Roth, J. D., and Strong, S. R. Self-made academic

predictions and academic performance. *Measurement and Evaluation in Guidance*, 1970, *3*, 81-85.

Biggs, D. A., and Tinsley, D. J. Student-made academic predictions. *Journal of Educational Research*, 1970, *63*, 195-197.

Binder, D. M., Jones, J. G., and Strowig, R. W. Non-intellective self-report variables as predictors of scholastic achievement. *The Journal of Educational Research*, 1970, *63*, 364-366.

Boldt, R. F. Accuracy of grade point statistics collected with the College Entrance Examination Board self-description blank. Memorandum, Princeton, N. J.: Educational Testing Service, 1973.

Brookover, W. B. *Self-concept of ability and school achievement I*. Cooperative Research Project No. 845, Michigan State University, Office of Research and Publications, December, 1962.

Brookover, W. B. et. al. *Self-concept of ability and school achievement II*. Cooperative Research Project No. 1636, Michigan State University, Office of Research and Publications, October, 1965.

Cole, N. S. Differential validity in the ACT tests. *ACT Research Report No. 30*, Iowa City, Iowa: The American College Testing Program, 1969.

Davidsen, O. M. Survey of reliability of student self-reported high school grades. Mimeo, Iowa City, Iowa: The American College Testing Program, 1963.

Denham, E. C. The prediction of college success with biographical data and self-ratings. Unpublished Doctoral Dissertation, University of Arkansas, 1966.

Doleys, E. J., and Renzaglia, G. A. Accuracy of student prediction of college grades. *Personnel and Guidance Journal*, 1963, *41*, 528-530.

Dunnette, M. D. Accuracy of students' reported honor point averages. *Journal of Applied Psychology*, 1952, *36*, 20-22.

Frederiksen, N., and Gilbert, A. C. F. Replication of a study of differential predictability. *Educational and Psychological Measurement*, 1960, *20*, 759-767.

Frederiksen, N., and Melville, S. D. Differential predictability in the use of test scores. *Educational and Psychological Measurement*, 1954, *14*, 647-656.

Freeberg, N. E. The biographical information blank as a predictor of student achievement: A review. *Psychological Reports*, 1967, *20*, 911-925.

Freehill, M. F. Student self-estimates as guidance in selection of courses. *College and University*, Fall, 1952, *27*, 233-242.

French, J. W. Comparative prediction of college major-field grades by pure-factor aptitude, interest, and personality measures. *Educational and Psychological Measurement*, 1963, *23*, 767-774.

French, J. W. Comparative prediction of high-school grades by pure-factor aptitude, information, and personality measures. *Educational and Psychological Measurement*, 1964, *24*, 321-329.

Furst, E. J. Validity of some objective scales of motivation for predicting academic achievement. *Educational and Psychological Measurement*, 1966, *26*, 927-933.

Gebhart, G. G., and Hoyt, D. P. Personality needs of under- and over-achieving freshmen. *Journal of Applied Psychology*, 1958, *42*, 125-128.

Ghiselli, E. E. The prediction of predictability. *Educational and Psychological Measurement*, 1960a, *20*, 3-8.

Ghiselli, E. E. Differentiation of tests in terms of the accuracy with which they predict for a given individual. *Educational and Psychological Measurement*, 1960b, *20*, 675-684.

Ghiselli, E. E. Moderating effects and differential reliability and validity. *Journal of Applied Psychology*, 1963, *47*, 81-86.

Gough, H. The construction of a personality scale to predict scholastic achievement. *Journal of Applied Psychology*, 1953, *37*, 261-266.

Hanna, G. S., Bligh, H. F., and Lenke, J. M. Student-reported grades as predictors. *Personnel and Guidance Journal*, 1970, *48*, 465-468.

Hanson, G. R., and Lamb, R. R. Level of college selectivity and the accuracy of self-reported high school grades. Forthcoming research report cited in American College Testing Program, *Assessing students on the way to college*, Vol. 1. Iowa City, Iowa, Author, 1973.

Hilton, T. L., and Myers, A. E. Growth Study II. Personal background experience, and school achievement: An investigation of the contribution of questionnaire data to academic prediction. *Research Bulletin RB 66-5*. Princeton, N. J.: Educational Testing Service, February, 1966.

Holland, J. L. The prediction of college grades from the California Psychological Inventory and the Scholastic Aptitude Test. *Journal of Educational Psychology*, 1959, *50*, 135-142.

Holland, J. L. Creative and academic performance among talented adolescents. *Journal of Educational Psychology*, 1961, *52*, 136-147.

Holland, J. L. Explorations of a theory of vocational choice: VI. A longitudinal study using a sample of typical college students. *Journal of Applied Psychology Monographs*, 1968, *52*, No. 1.

Holland, J. L., and Astin, A. W. The prediction of academic, artistic, scientific and social achievement of undergraduates of superior scholastic aptitude. *Journal of Educational Psychology*, 1962, *53*, 132-143.

Holland, J. L., and Nichols, R. C. Prediction of academic and extracurricular achievement in college. *Journal of Educational Psychology*, 1964, *55*, 55-65.

Holland, J. L., and Richards, J. M., Jr. Academic and non-academic accomplishment: Correlated or uncorrelated? *Journal of Educational Psychology*, 1965, *56*, 165-174.

Holmes, D. S., and Tyler, J. D. Direct versus projective meas-

urement of achievement motivation. *Journal of Consulting and Clinical Psychology*, 1968, *32*, 712-717.

Horst, P. A technique for the development of a differential prediction battery. *Psychological Monographs*, 1954, *68*, No. 9, whole number 380.

Horst, P. A technique for the development of a multiple absolute prediction battery. *Psychological Monographs*, 1955, *69*, No. 5, whole number 390.

Hoyt, D. P. Three years of research in the American College Testing Program. Paper read at Iowa Psychological Association, Des Moines, 1963.

Hoyt, D. P., and Munday, L. A. *Your college freshmen*. Iowa City, Iowa: The American College Testing Program, 1968.

Jacobs, J. N. Aptitude and achievement measures in predicting high school success. *Personnel and Guidance Journal*, 1959, *37*, 324-34.

Jones, J. G., and Grieneeks, L. Measures of self-perception as predictors of scholastic achievement. *The Journal of Educational Research*, 1970, *63*, 201-203.

Keefer, K. E. Self-prediction of academic achievement by college students. *Journal of Educational Research*, 1969, *63*, 53-56.

Kirk, B. A., and Sereda, L. Accuracy of self-reported college grade averages and characteristics of non- and discrepant reporters. *Educational and Psychological Measurement*, 1969, *29*, 147-155.

Klein, S. P., Rock, D. A., and Evans, F. R. The use of multiple moderators in academic prediction. *Journal of Educational Measurement*, 1968, *5*, 151-160.

Lindsay, C. A., and Althouse, R. Comparative validities of the Strong Vocational Interest Blank Academic Achievement Scale and the College Student Questionnaire Motivation for Grades Scale. *Educational and Psychological Measurement*, 1969, *29*, 489-493.

Lunneborg, C. E. A research review of the Washington Pre-College Testing Program. *Journal of Educational Measurement*, 1966, *3*, 157-166.

Lunneborg, C. E. Biographic variables in differential vs. absolute prediction. *Journal of Educational Measurement*, 1968, *5*, 207-210.

Lunneborg, C. E., and Lunneborg, P. W. The prediction of different criteria of law school performance. *Educational and Psychological Measurement*, 1966, *26*, 935-944.

Lunneborg, C. E., and Lunneborg, P. W. Architecture school performance predicted from ASAT, intellective and nonintellective measures. *Journal of Applied Psychology*, 1969, *53*, 209-213.

Lunneborg, P. W., and Lunneborg, C. E. The differential prediction of college grades from biographical information. *Educational and Psychological Measurement*, 1966, *26*, 917-925.

Maxey, E. J. A comparison of student-reported and school-reported grades in predicting college GPA. Unpublished manuscript, Iowa City, Iowa: The American College Testing Program, 1972.

Maxey, E. J. and Ormsby, V. J. The accuracy of self-report information collected on the ACT Test Battery: High school grades and items of nonacademic achievement. *ACT Research Report No. 45*. Iowa City, Iowa: Author, 1971.

Munday, L. A. Predicting grades using ACT data. *Educational and Psychological Measurement*, 1967, *27*, 401-406.

Myers, R. C. Biographical factors and academic achievement: An experimental investigation. *Educational and Psychological Measurement*, 1952, *12*, 415-426.

Myers, R. C., and Schultz, D. Predicting academic achievement with a new Attitude-Interest Questionnaire. *Educational and Psychological Measurement*, 1950, *10*, 654-663.

Nichols, R. C. Non-intellective predictors of achievement in college. *Educational and Psychological Measurement*, 1966, *26*, 899-915.

Nichols, R. C., and Holland, J. L. Prediction of the first-year college performance of high aptitude students. *Psychological Monographs*, 1963, *77*, No. 7, whole number 570.

Oppenheim, D. Summary of studies using the Motivation for Grades Scale. Program Report. Princeton, N. J.: Educational Testing Service, 1970.

Perry, J. D. The reliability of high school averages computed from students' estimates of their high school grades. *School and Society*, 1940, *52*, 63-64.

Peterson, R. E. *Technical manual: College Student Questionnaires*. Princeton, N. J.: Educational Testing Service, 1965.

Richards, J. M., Jr., Holland, J. L., and Lutz, S. W. Prediction of student accomplishment in college. *Journal of Educational Psychology*, 1967, *58*, 343-355.

Richards, J. M., Jr., and Lutz, S. W. Predicting student accomplishment in college from the ACT Assessment. *Journal of Educational Measurement*, 1968, *5*, 17-29.

Roberts, R. J. Prediction of college performance of superior students. *NMSC Research Report* 1, 5, 1965.

Rock, D. A. Improving the prediction of academic achievement by population moderators. Unpublished doctoral dissertation, Purdue University, 1965.

Saunders, D. R. Moderator variables in prediction. *Educational and Psychological Measurement*, 1956, *16*, 209-222.

Schultz, D. G., and Green, B. F., Jr. Predicting academic achievement with a new attitude interest questionnaire. *Educational and Psychological Measurement*, 1953, *13*, 54-64.

Seashore, H. G. Women are more predictable than men. *Journal of Counseling Psychology*, 1962, *9*, 261-270.

Sproull, K. H. The relation between high school self-concept of academic ability and subsequent academic achievement in the community college. Unpublished doctoral dissertation, Michigan State University, 1969.

Starks, D. D. The utilization of biographical information in the prediction of academic achievement. Unpublished doctoral dissertation, Purdue University, 1967.

Stricker, L. J. Compulsivity as a moderator variable: A replication and extension. *Journal of Applied Psychology*, 1966, *50*, 331-335.

Walsh, W. B. Validity of self-report. *Journal of Counseling Psychology*, 1967, *14*, 18-23.

Walsh, W. B. Validity of self-report: Another look. *Journal of Counseling Psychology*, 1968, *15*, 180-186.

Walsh, W. B. Self-report under socially undesirable and distortion conditions. *Journal of Counseling Psychology*, 1969, *16*, 569-574.

Webb, S. C. The comparative validity of two biographical inventory keys. *Journal of Applied Psychology*, 1960, *44*, 177-180.

Wiggins, N., Blackburn, M., and Hackman, R. Prediction of first year graduate success in psychology. *Proceedings, 76th Annual Convention*, American Psychological Association, 1968.

Section II

Abe, C., and Holland, J. L. A description of college freshmen, I. Students with different choices of major field. *ACT Research Report No. 3*. Iowa City, Iowa: The American College Testing Program, 1965.

Alexander, K., and Eckland, B. K. Contextual effects in the high school educational attainment process. *Report No. 178, Center for Social Organization of Schools*. The Johns Hopkins University, Baltimore, Md., 1974.

Altbach, P. G., and Kelley, D. H. *American students: A selected bibliography on student activism and related topics*. Boston: Lexington Books, 1973.

Anderson, A. R. Group counseling. *Review of Educational Research*, 1969, *30*, 209-226.

Astin, A. W. Personal and environmental factors associated with college dropouts among high aptitude students. *Journal of Educational Psychology*, 1964, *55*, 219-227.

Astin, A. W. *Who goes where to college?* Chicago: Science Research Associates, 1965a.

Astin, A. W. College preferences of very able students. *College and University*, 1965b, *40*, 282-297.

Astin, A. W. *The college environment*. Washington, D. C.: American Council on Education, 1968a.

Astin, A. W. Personal and institutional determinants of student activism. *Measurement and Evaluation in Guidance*, 1968b, *1*, 149-162.

Astin, A. W. College dropouts: A national profile. *ACE Research Reports, Vol. 7, No. 1*. Washington, D. C.: American Council on Education, 1972.

Astin, A. W. *Preventing students from dropping out: A longitudinal, multi-institutional study of college dropouts*. San Francisco: Jossey-Bass, 1975.

Astin, A. W., and Panos, R. J. *The educational and vocational development of college students*. Washington, D. C.: American Council on Education, 1969.

Astin, A. W., Panos, R. J., and Creager, J. A. National norms for entering college freshmen—fall, 1966. *ACE Research Reports, Vol. 2, No. 1*. Washington, D. C.: American Council on Education, 1967.

Bain, R. K., and Anderson, J. G. School context and peer influences on educational plans of adolescents. *Review of Educational Research*, 1974, *44*, 429-446.

Baird, L. L. Family income and the characteristics of college-bound students. *ACT Research Report No. 17*. Iowa City, Iowa: American College Testing Program, 1967a.

Baird, L. L. The educational goals of college-bound youth. *ACT Research Report No. 19*. Iowa City, Iowa: American College Testing Program, 1967b.

Baird, L. L. Patterns of educational aspiration. *ACT Research Report No. 32*. Iowa City, Iowa: American College Testing Program, 1969a.

Baird, L. L. The effects of college residence groups on students' self concepts, goals, and achievements. *Personnel and Guidance Journal*, 1969b, *47*, 1015-1021.

Baird, L. L. Who protests: A study of student activists. In J. Foster and D. Long, (Eds.). *Protest!. Student activism in America*. New York: Morrow and Co., 1970.

Baird, L. L. *Careers and curricula: A report on the activities and views of graduates a year after leaving college*. Princeton, N. J.: Educational Testing Service, 1974.

Baird, L. L., Clark, M. J., and Hartnett, R. T. *The graduates*. Princeton, N. J.: Educational Testing Service, 1973.

Baird, L. L., and Holland, J. L. The flow of high school students to schools, colleges, and jobs: A re-examination of some old questions by the use of multiple indices of talent rather than by a single academic index. *Journal of Human Resources*, 1969, *4*, 22-37.

Baird, L. L., and Richards, J. M., Jr. The effects of selecting college students by various kinds of high school achievements. *ACT Research Report No. 23*. Iowa City, Iowa: American College Testing Program, 1968.

Bayer, A. The college dropout: Factors affecting senior college completion. *Sociology of Education*, 1968, *41*, 305-316.

Bayer, A. E., and Boruch, R. F. The black student in American colleges. *ACE Research Report*, Vol. 4, No. 2, 1969.

Beal, P. E., and Williams, D. A. An experiment with mixed-class housing assignments at the University of Oregon. *Student Housing Research*, February, 1968, 1-2.

Beezer, R. H., and Hjelm, H. F. Factors related to college attendance. U. S. Department of Health, Education, and Welfare, Cooperative Research Monograph No. 8. (OE-54023) Washington: U. S. Government Printing Office, 1961.

Berdie, R. F., and Hood, A. B. *Decisions for tomorrow: plans of*

high school seniors for after graduation. Minneapolis: University of Minnesota Press, 1965.

Blough, T. B. A critical analysis of selected research literature on the problem of school dropouts. Unpublished doctoral dissertation, University of Pittsburgh, 1956.

Bordua, D. J. Educational aspirations and parental stress on college. *Social Forces*, 1960, *38*, 262-269.

Boyle, R. P. The effect of the high school on students' aspirations. *American Journal of Sociology*, 1966, *71*, 628-639.

Brown, R. D. Manipulation of the environmental press in a college residence hall. *Personnel and Guidance Journal*, 1968, *46*, 555-560.

Campbell, E. Q., and Alexander, C. N. Structural effects and interpersonal relationships. *American Journal of Sociology*, 1965, *71*, 284-289.

Chase, C. I. The non-persisting university freshman. *Journal of College Student Personnel*, 1968, *9*, 165-170.

Coffelt, J. J., and Hobbs, D. S. *In and out of college*. Oklahoma City: Oklahoma State Regents for Higher Education, 1954.

Crites, J. O. *Vocational psychology*. New York: McGraw-Hill, 1970.

Darley, J. G. *Promise and performance: A study of ability and achievement in higher education*. Berkeley, Calif.: Center for the Study of Higher Education, University of California, 1956.

Davis, J. A. *Great aspirations*. Chicago: Aldine Press, 1965a.

Davis, J. A. *Undergraduate career decisions*. Chicago: Aldine Press, 1965b.

Dollar, R. J. Student characteristics and choice of housing. *Journal of College Student Personnel*, 1966, *7*, 147-150.

Douvan, E., and Adelson, J. *The adolescent experience*. New York: Wiley, 1966.

Eckland, B. K. A source of error in college attrition studies. *Sociology of Education*, 1964, *38*, 60-72.

Educational Testing Service. Background factors relating to college plans and college enrollment among public high school students. Princeton, N. J.: Author, 1957.

Elder, G. Parental power legitimation and its effect on the adolescent. *Sociometry*, 1963, *26*, 50-65.

Feldman, K. A., and Newcomb, T. M. *The impact of college on students*. San Francisco: Jossey-Bass, 1969.

Flacks, R. Who protests: The social bases of the student movement. In J. Foster and D. Long (Eds.). *Protest!: Student activism in America*. New York: Morrow and Co., 1970, pp. 134-157.

Flanagan, J. C., and Cooley, W. W. *Project Talent: One-year followup studies*. Final report to the U. S. Office of Education, Cooperative Research Project No. 2333, Pittsburgh, University of Pittsburgh, 1966.

Folger, J. K., Astin, H. S., and Bayer, A. E. *Human resources and higher education*. New York: Russell Sage Foundation, 1970.

Goode, W. *The family*. Englewood Cliffs, N. J.: Prentice-Hall, 1964.

Hauser, R. M. Educational stratification in the United States. *Sociological Inquiry*, 1970, *40*, 102-109.

Holland, J. L. Determinants of college choice. *College and University*, 1959, *35*, 11-28.

Holland, J. L. Explorations of a theory of vocational choice: VI. A longitudinal study using a sample of typical college students. *Journal of Applied Psychology Monographs*, 1968, *52*, No. 1.

Holland, J. L. *Making vocational choices: A theory of careers*. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1973.

Hood, A. B., and Swanson, E. O. What type of college for what type of student? U. S. Department of Health, Education, and Welfare, Cooperative Research Project No. 2182. Minneapolis: Student Counseling Bureau, University of Minnesota, 1965.

Hoyt, D. P. Description and prediction of diversity among four-year colleges. *Measurement and Evaluation in Guidance*, 1968, *1*, 16-26.

Iffert, R. E. Retention and withdrawal of college students. U. S. Department of Health, Education, and Welfare, Office of Education Bulletin 1958, No. 1. Washington, D. C.: U. S. Government Printing Office, 1957.

Iffert, R. E., and Clarke, B. S. College applicants, entrants, dropouts. U. S. Department of Health, Education, and Welfare, Office of Education Bulletin 1965, No. 29. Washington, D. C.: U. S. Government Printing Office, 1965.

Island, D. D. Counseling students with special problems. *Review of Educational Research*, 1969, *30*, 239-250.

Jackson, R., and Winkler, R. C. A comparison of pledges and independents. *Personnel and Guidance Journal*, 1964, *43*, 379-382.

Jansen, D. G., Winbora, B. B. and Martinson, W. D. Characteristics associated with campus social-political action leadership. *Journal of Counseling Psychology*, 1968, *15*, 552-562.

Jencks, C., Smith, M., Ackland, H., Bane, M. J., Cohen, D., Gintis, H., Heyns, B., and Michelson, S. *Inequality: A reassessment of the effect of family and schooling in America*. New York: Basic Books, 1972.

Johnson, E. Fraternity members compared with independents on the biographical scale of the CSQ. *Journal of College Student Personnel*, 1970, *11*, 284-285.

Kahl, J. A. Educational and occupational aspirations of "common man" boys. *Harvard Educational Review*, 1953, *23*, 186-203.

Kahn, R., and Bowers, W. J. The social context of the rank-and-file student activist: A test of four hypotheses. *Sociology of Education*, 1970, *43*, 38-55.

Kaludis, G., and Zatkin, G. Anatomy of a pledge class. *Journal of College Student Personnel*, 1966, *7*, 282-284.

Knoell, D. M. A critical review of research on college dropout.

In L. A. Pervin, L. E. Reik, and W. Dalrymple (Eds.). *The college dropout and the utilization of talent*. Princeton, N. J.: Princeton University Press, 1966, 63-81.

Korn, H. A. Higher education programs and student development. *Review of Educational Research*, 1969, *39*, 155-172.

Levine, G. N., and Sussman, L. A. Social class and sociability in fraternity pledging. *American Journal of Sociology*, 1960, *65*, 391-399.

Longino, C. G., and Kart, C. S. The college fraternity: An assessment of theory and research. *Journal of College Student Personnel*, 1973, *14*, 118-125.

McDill, E. L., Rigsby, L. C., and Meyers, E. D., Jr. Educational climates of high schools: Their effects and sources. *American Journal of Sociology*, 1969, *74*, 567-586.

McGuire, D. Multiple discriminant analysis of test scores and biographical data for the description and prediction of 12th grade educational outcomes. Unpublished doctoral dissertation, University of Illinois, 1967.

Medsker, L. L., and Trent, J. W. The influence of different types of public higher institutions on college attendance from varying socioeconomic and ability levels. U. S. Department of Health, Education, and Welfare Cooperative Research Project, No. 438. Berkeley, Calif.: University of California, 1965.

Meyer, J. W. High school effects on college intentions. *American Journal of Sociology*, 1970, *76*, 59-70.

Michael, J. A. High school climates and plans for entering college. *Public Opinion Quarterly*, 1961, *25*, 585-595.

Michigan Student Study, 1967a. Ten fraternities at the University of Michigan: Preliminary report from the Student Organizations Study. Ann Arbor: Institute for Social Research, University of Michigan.

Michigan Student Study, 1967b. Ten sororities at the University of Michigan: Preliminary report for the Student Organizations Study. Ann Arbor: Institute for Social Research, University of Michigan.

Miller, L. D. Distinctive characteristics of fraternity members. *Journal of College Student Personnel*, 1973, *14*, 126-129.

Morishima, J. K. Effects on student achievement of residence hall groupings based on academic majors. In C. H. Bagley (Ed.). *Research on academic input: Proceedings of the Sixth Annual Forum of the Association for Institutional Research*. Cortland, N. Y.: State University of New York at Cortland, 1966.

Morrow, W., and Wilson, R. C. Family relations of bright high achieving and under-achieving high school boys. *Child Development*, 1961, *32*, 501-510.

Nam, C. B., and Cowling, J. D. Factors related to college attendance of farm and non-farm high school graduates, 1960. U. S. Department of Commerce, Bureau of the Census, ERS, No. 32. Washington, D. C.: Department of Commerce and U. S. Department of Agriculture, 1962.

Newcomb, T. M., and Wilson, E. K. (Eds.). *College peer groups*. Chicago: Aldine, 1966.

Osipow, S. H. *Theories of career development* (2nd ed.). New York: Appleton-Century-Crofts, 1973.

Pace, C. R. *College and University Environment Scales: Technical manual* (2nd ed.). Princeton, N. J.: Educational Testing Service, 1969.

Peterson, R. E. *Technical manual: College Student Questionnaires*. Princeton, N. J.: Educational Testing Service, 1965.

Prediger, D. J. Biographical data differentiating college attenders and non-attenders at various ability levels. Paper read at American Personnel and Guidance Association, Las Vegas, 1969.

Rehberg, R. A., Sinclair, J., and Schafer, W. E. Adolescent achievement behavior, family authority structure, and parental socialization practices. *American Journal of Sociology*, 1970, *75*, 1012-1034.

Rehberg, R. A., and Westby, D. L. Parental encouragement, occupation, education, and family size: Artifactual or independent determinants of adolescent educational expectations? *Social Forces*, 1967, *45*, 362-374.

Rogoff, N. The decision to study medicine. In R. K. Merton, G. G. Reader, and P. L. Kendall. *The student physician*. Cambridge, Mass.: Harvard University Press, 1957.

Rogoff, N. Local social structure and educational selection. In A. H. Halsey, J. Floud, and C. A. Anderson (Eds.). *Education, economy, and society: A reorder in the sociology of education*. New York: Free Press, 1963.

Rosen, B. The achievement syndrome and economic growth in Brazil. *Social Forces*, 1964, *42*, 341-354.

Rossi, P. H., and Coleman, J. S. (Eds.). *Determinants and consequences of college choice*. Chicago: National Opinion Research Center, University of Chicago, 1964.

Rossman, J. E., and Kirk, B. A. Factors related to persistence and withdrawal among university students. *Journal of Counseling Psychology*, 1970, *17*, 56-62.

Schoenfeldt, L. F. Post-high-school education. In J. C. Flanagan and W. W. Cooley (Eds.). Project TALENT: One year follow-up studies. U. S. Department of Health, Education, and Welfare, Cooperative Research Project No. 2333. Pittsburgh, 1966.

Schoenfeldt, L. F. Education after high school. *Sociology of Education*, 1968, *41*, 350-369.

Scott, W. A. *Values and organizations: A study of fraternities and sororities*. Chicago: Rand McNally, 1965.

Sewell, W. H. Community of residence and college plans. *American Sociological Review*, 1964, *29*, 24-38.

Sewell, W. H., and Armer, J. M. Neighborhood context and college plans. *American Sociological Review*, 1966, *31*, 159-168.

Sewell, W. H., and Shah, V. P. Socioeconomic status, intelligence, and the attainment of higher education. *Sociology*

of Education, 1967, *40*, 1-23.

Sewell, W. H., and Shah, V. P. Social class, parental encouragement, and educational aspirations. *American Journal of Sociology*, 1968, *73*, 559-572.

Sexton, V. S. Factors contributing to attrition in college populations: Twenty-five years of research. *Journal of General Psychology*, 1965, *72*, 301-326.

Simmons, N. G. Junior college-going plans and actual college attendance of academically superior high school seniors in the state of Georgia for the 1961-62 school year. Unpublished doctoral dissertation, University of Georgia, 1963.

Simpson, R. L. Parental influence, anticipatory socialization, and social mobility. *American Sociological Review*, 1962, *27*, 517-522.

Slocum, W. L. *Occupational careers* (2nd ed.). Chicago: Aldine, 1974.

Spady, W. G. Dropouts from higher education: An interdisciplinary review and synthesis. *Interchange*, 1970, *1*, 64-85.

Spady, W. G. Status, achievement, and motivation in the American high school. *School Review*, 1971, *79*, 379-404.

Stark, M. Commuter and residence hall students compared. *Personnel and Guidance Journal*, 1965, *44*, 277-281.

Stroup, F., and Andrew, D. C. Barriers to college attendance: The report of a study of factors related to educational discontinuance of high-school graduates. U. S. Department of Health, Education, and Welfare Cooperative Research Project 008. Magnolia, Arkansas: Southern State College, 1959.

Summerskill, J. Dropouts from college. In N. Sanford (Ed.), *The American college: A psychological and social interpretation of the higher learning*. New York: Wiley, 1962.

Super, D. E., and Crites, J. O. *Appraising vocational fitness* (rev. ed.). New York: Harper and Row, 1962.

Thistlethwaite, D. L. Recruitment and retention of talented college students: Final report of factors influencing the recruitment and training of intellectually talented students in higher educational programs. U. S. Department of Health, Education, and Welfare, Cooperative Research Project No. 19-098. Nashville: Vanderbilt University, 1963.

Tinto, V. Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research*, 1975, *45*, 89-126.

Trent, J. W. Personal factors in college choice. Paper read at annual meeting of the College Entrance Examination Board, 1965.

Trent, J. W., and Medsker, L. *Beyond high school*. San Francisco: Jossey-Bass, 1968.

Turner, R. H. *The social context of ambition*. San Francisco: Chandler, 1964.

Varner, S. E. *School dropouts: Research summary, 1967-81*. Washington, D. C.: National Education Association, 1967.

Warkov, S., and Zelan, J. *Lawyers in the making*. Chicago: Aldine, 1965.

Watley, D. J. Career progress of Merit scholars. *National Merit Scholarship Corporation Research Reports 4*, No. 1, 1968.

White, R. W. *Lives in progress: A study of the natural growth of personality*. New York: Holt, 1952.

Wilson, A. B. Residential segregation of social classes and aspirations of high school boys. *American Sociological Review*, 1959, *24*, 836-843.

Wilson, E. K. The entering student: Attributes and agents of change. In T. M. Newcomb and E. K. Wilson (Eds.), *College peer groups*. Chicago: Aldine, 1966.

Section III

Albright, L. E., and Glennon, J. R. Personal history correlates of physical scientists' career aspirations. *Journal of Applied Psychology*, 1961, *45*, 281-284.

American College Testing Program. *Assessing students on the way to college*. Author, Iowa City: Iowa, 1973.

Anastasi, A., and Schaefer, C. E. Biographical correlates of artistic and literary creativity in adolescent girls. *Journal of Applied Psychology*, 1969, *53*, 267-273.

Baird, L. L. The achievements of bright and average students. *Educational and Psychological Measurement*, 1968, *28*, 891-899.

Baird, L. L. The prediction of accomplishment in college: An exploration of the process of achievement. *Journal of Counseling Psychology*, 1969a, *16*, 246-254.

Baird, L. L. Factors in the continuance of accomplishment from high school to college. *Measurement and Evaluation in Guidance*, 1969b, *2*, 5-18.

Baird, L. L., and Richards, J. M., Jr. The effects of selecting college students by various kinds of high school achievements. *ACT Research Report No. 23*. Iowa City, Iowa: American College Testing Program, 1968.

Chambers, J. A. Relating personality and biographical factors to scientific creativity. *Psychological Monographs*, 1964, *87*, 7.

Dellas, M., and Gaier, E. L. Identification of creativity: The individual. *Psychological Bulletin*, 1970, *73*, 55-73.

Elton, C. F., and Shevel, L. R. Who is talented? An analysis of achievement. *ACT Research Report No. 31*. Iowa City, Iowa: American College Testing Program, 1969.

Golann, S. E. Psychological study of creativity. *Psychological Bulletin*, 1963, *60*, 548-565.

Helson, R. Personality of women with imaginative and artistic interests: The role of masculinity, originality, and other characteristics in their creativity. *Journal of Personality*, 1966, *34*, 1-25.

Helson, R. Sex differences in creative style. *Journal of Personality*, 1967, *35*, 214-233.

Holland, J. L. Creative and academic performance among talented adolescents. *Journal of Educational Psychology*, 1961, *52*, 136-147.

Holland, J. L., and Astin, A. W. The prediction of academic, artistic, scientific, and social achievement of undergraduates of superior scholastic aptitude. *Journal of Educational Psychology*, 1962, *53*, 132-143.

Holland, J. L., and Nichols, R. C. Prediction of academic and extracurricular achievement in college. *Journal of Educational Psychology*, 1964, *55*, 55-65.

Holland, J. L., and Richards, J. M., Jr. Academic and nonacademic accomplishment: Correlated or uncorrelated? *Journal of Educational Psychology*, 1965, *56*, 165-174.

Holland, J. L., and Richards, J. M., Jr. Academic and nonacademic accomplishment in a representative sample of students taking the American College Tests. *College and University*, 1967, *43*, 60-71.

Kirk, B. A., and Sereda, L. Accuracy of self-reported grade averages and characteristics of non- and discrepant reporters. *Educational and Psychological Measurement*, 1969, *29*, 147-155.

Kulberg, G. E., and Owens, W. A. Some life history antecedents of engineering interests. *Journal of Educational Psychology*, 1960, *51*, 26-31.

MacKinnon, D. W. The nature and nurture of creative talent. *American Psychologist*, 1962, *17*, 484-495.

Maxey, E. M., and Ormsby, V. J. The accuracy of self-report information collected on the ACT Test Battery: High school grades and items of nonacademic achievement. *ACT Research Report No. 45*. Iowa City, Iowa: Author, 1971.

McDermid, C. D. Some correlates of creativity in engineering personnel. *Journal of Applied Psychology*, 1965, *49*, 14-19.

Morrison, R. F., Owens, W. A., Glennon, J. R., and Albright, L. E. Factored life history antecedents of industrial research performance. *Journal of Applied Psychology*, 1962, *46*, 281-284.

Mosel, J. N., and Cozan, L. W. The accuracy of application blank work histories. *Journal of Applied Psychology*, 1952, *36*, 365-369.

Munday, L. A., and Davis, J. C. Varieties of achievement after college: Perspective on the meaning of academic talent. *ACT Research Report No. 57*. Iowa City, Iowa: Author, 1974.

Nichols, R. C. Non-intellective predictors of achievement in college. *Educational and Psychological Measurement*, 1966, *26*, 899-915.

Nichols, R. C., and Holland, J. L. Prediction of the first-year college performance of high aptitude students. *Psychological Monographs*, 1963, *77*, No. 7, whole number 570.

Richards, J. M., Jr., Holland, J. L., and Lutz, S. W. Prediction of student accomplishment in college. *Journal of Educational Psychology*, 1967, *58*, 343-355.

Richards, J. M., Jr., and Lutz, S. W. Predicting student accomplishment in college from the ACT Assessment. *Journal of Educational Measurement*, 1968, *5*, 17-29.

Roberts, R. J. Prediction of college performance of superior students. *National Merit Scholarship Corporation Research Report*, 1965, *1*, 5.

Roe, A. *The making of a scientist*. New York: Dodd, Mead, 1952.

Schaefer, C. E. The prediction of creative achievement from a biographical inventory. *Educational and Psychological Measurement*, 1969, *29*, 431-437.

Schaefer, C. E., and Anastasi, A. A biographical inventory for identifying creativity in adolescent boys. *Journal of Applied Psychology*, 1968, *52*, 42-48.

Smith, W. J., Albright, L. E., and Glennon, J. R. The prediction of research competence and creativity from personal history. *Journal of Applied Psychology*, 1961, *45*, 59-62.

Taylor, C. W., Cooley, G. M., and Nielsen, E. C. Identifying high school students with characteristics needed in research work. University of Utah, 1963 (mimeo.).

Taylor, C. W., and Ellison, R. L. Biographical predictors of scientific performance. *Science*, 1967, *155*, 1075-1080.

Taylor, C. W., and Holland, J. L. Predictors of creative performance. In C. W. Taylor (Ed.), *Creativity: progress and potential*. New York: McGraw-Hill, 1964.

Wallach, M. A., and Wing, C. W., Jr. *The talented student: A validation of the creativity-intelligence distinction*. New York: Holt, Rinehart and Winston, 1969.

Section IV

Antonovsky, A., and Lerner, M. J. Occupational aspirations of lower class negroes and white youth. *Social Problems*, 1959, *7*, 132-138.

Baird, L. L. Family income and the characteristics of college-bound students. *ACT Research Report No. 17*. Iowa City, Iowa: American College Testing Program, 1967.

Baird, L. L. Patterns of educational aspiration. *ACT Research Report No. 32*. Iowa City, Iowa: American College Testing Program, 1969.

Baird, L. L. Overaspirers and underaspirers: Students with discrepant ability and degree plans. Presented at 1970 National Council on Measurement in Education meetings, 1970.

Bayer, A. E. The black college freshman: Characteristics and recent trends. *ACE Research Reports, Vol. 7, No. 3*. Washington, D. C.: American Council on Education, 1972.

Bayer, A. E., and Boruch, R. F. The black student in American colleges. *ACE Research Reports, Vol. 4, No. 2*. Washington, D. C.: American Council on Education, 1969.

Beilin, H., and Bergin, K. V. The social mobility of a limited urban group and some implications for counseling. *Personnel and Guidance Journal*, 1956, *34*, 544-552.

Berelson, B., and Steiner, G. A. *Human behavior: An inventory of scientific findings*. New York: Harcourt, Brace and World, 1964.

Centers, R. *The psychology of social classes*. Princeton, N. J.:

Princeton University Press, 1949.

Cross, P. K. *The junior college student: A research description*. Princeton, N. J.: Educational Testing Service, 1968.

Davie, J. S. Satisfaction and the college experience. In B. M. Wedge (Ed.). *Psychosocial problems of college men*. New Haven, Conn.: Yale University Press, 1958.

Deutch, M., Katz, I., and Jensen, A. R. (Eds.). *Social class, race, and psychological development*. New York: Holt, Rinehart and Winston, 1968.

Dreger, R. M., and Miller, K. S. Comparative psychological studies of negroes and whites in the United States, 1959-1965. *Psychological Bulletin Monograph Supplement*, 1968, *70*, 1-39.

Epps, E. G. Correlates of academic achievement among northern and southern urban negro students. *Journal of Social Issues*, 1969, *25*, 55-70.

Feldman, K. A., and Newcomb, T. M. *The impact of college on students*. San Francisco: Jossey-Bass, 1969.

Fichter, Joseph H. *Graduates of predominantly negro colleges*. Public Health Services Publication No. 1571. Washington: U. S. Government Printing Office, 1967.

Freedman, M. B. *The college experience*. San Francisco: Jossey-Bass, 1967.

Ginzberg, E., Ginsburg, S. W., Axelrod, S., and Herma, J. L. *Occupational choice: An approach to a general theory*. New York: Columbia University Press, 1951.

Gottlieb, D. Social class, achievement, and the college-going experience. *School Review*, 1962, *70*, 273-286.

Hartnett, R. T. Differences in selected attitudes and college orientations between black students attending traditionally negro and traditionally white institutions. *Sociology of Education*, 1970, *43*, 419-436.

Hartnett, R. T., and Peterson, R. E. Religious preferences as a factor in attitudinal and background differences among college freshmen. *Sociology of Education*, 1968, *41*, 227-237.

Herriott, R., and St. John, N. *Social class and the urban school*. New York: John Wiley, 1966.

Holmstrom, I. Low income students: Do they differ from "typical" undergraduates? *ACE Research Reports, Vol. 8, No. 5*. Washington, D. C.: American Council on Education, 1973.

Hull, W. F., and Davies, M. W. The black student in higher education: A second bib. ography. *Journal of College Student Personnel*, 1973, *14*, 309-312.

Jones, J. D., and Finnell, W. S. Relationship between college experiences and attitudes of students from economically deprived backgrounds. *Journal of College Student Personnel*, 1972, *13*, 314-318.

Kerckhoff, A. C., Mason, W. M., and Poss, S. S. On the accuracy of children's reports of family social status. *Sociology of Education*, 1973, *46*, 219-247.

Lane, W. C. The lower-class girl in college: A study of Stanford freshman women. Unpublished doctoral dissertation, Stanford University, 1960.

Lott, A. J., and Lott, B. E. *Negro and white youth*. New York: Holt, Rinehart and Winston, Inc., 1963.

Matteson, R. W. Experience-interest relationships as measured by an activity check list. *Journal of Counseling Psychology*, 1955, *2*, 13-16.

McLaughlin, B. S. Identity and personality: A study of self-perceived identity in college students. Unpublished doctoral dissertation, Harvard University, 1965.

Packard, V. *The status seekers*. New York: Pocket Books, 1961.

Parsons, T., and Clark, K. B. (Eds.). *The Negro American*. Boston: Houghton-Mifflin, 1965.

Peterson, R. E. *Technical manual: College Student Questionnaire*. Princeton, N. J.: Educational Testing Service, 1965.

Peterson, R. E. The student life in American higher education. *Daedalus*, 1968, *97* (No. 1), 293-317.

Pettigrew, T. F. *A profile of the negro American*. New York: Van Nostrand Co., 1964.

Riessman, F. *The culturally deprived child*. New York: Harper and Row, 1962.

Rosen, B. C. Race, ethnicity, and the achievement syndrome. *American Sociological Review*, 1959, *24*, 47-60.

Spady, W. G. Status, achievement, and motivation in the American high school. *School Review*, 1971, *79*, 379-404.

Tate, P., and Deworth, U. The broccoli syndrome: Higher education's putdown of the minority student. *Journal of College Student Personnel*, 1973, *14*, 293-295.

Werts, C. E. Social class and initial career choice of college freshmen. *Sociology of Education*, 1966, *39*, 74-85.

Werts, C. E. Career choice patterns: Ability and social class. *Sociology of Education*, 1967, *40*, 348-358.

Whyte, D. R. Social alientation among college students. Unpublished doctoral dissertation, Cornell University, 1963.

Section V

American Q&I Co. Predicting employee turnover from personnel data. Author, 1962.

Asher, J. J. The biographical item: Can it be improved? *Personnel Psychology*, 1972, *25*, 251-269.

Astin, A. W., and Panos, R. J. *The educational and vocational development of college students*. Washington, D. C.: American Council on Education, 1969.

Baehr, M. E., and Williams, G. B. Prediction of sales success from factorially determined dimensions of personal background data. *Journal of Applied Psychology*, 1968, *52*, 98-103.

Buel, W. D. Voluntary female clerical turnover: The concurrent and predictive validity of a weighted application blank. *Journal of Applied Psychology*, 1964, *48*, 180-182.

Campbell, D. P. *Handbook for the Strong Vocational Interest Blank*. Stanford, Calif.: Stanford University Press, 1971.

Cooley, W. W. *Career development of scientists*. Cooperative

Research Project No. 436. U. S. Office of Education, 1963.

Cooley, W. W. Interactions among interests, abilities, and career plans. *Journal of Applied Psychology Monographs, 1967, 51*, No. 5, part 2, 1-16.

Darley, J. G., and Hagenah, T. *Vocational interest measurement: Theory and practice*. Minneapolis: University of Minnesota Press, 1955.

Dolliver, R. H. Strong Vocational Interest Blank versus expressed vocational interests: A review. *Psychological Bulletin*, 1969, *72*, 95-107.

Dunnette, M. D., Kirchner, E. K., Erickson, J. R., and Banas, P. A. Predicting turnover of female office employees. *Personnel Administration*, 1960, *23*, 45-50.

Dyer, D. T. The relation between vocational interests in men in college and their subsequent histories for ten years. *Journal of Applied Psychology*, 1939, *23*, 280-288.

England, G. W. *Development and use of weighted application blanks* (rev. ed.). Minneapolis: Industrial Relations Center, University of Minnesota, 1971.

Enright, J. B., and Pinneau, S. R. Predictive value of subjective choice of occupation and the Strong Vocational Interest Blank over fifteen years. *American Psychologist*, 1955, *10*, 424-425.

Flanagan, J. C., et. al. *Project TALENT one-year follow-up studies*. Palo Alto, Calif.: Project TALENT Office, American Institutes for Research, 1966.

Fleishman, E. A., and Berniger, J. One way to reduce office turnover. *Personnel*, 1960, *37*, 63-70.

Gade, E. M., and Soliah, D. Vocational Preference Inventory high point codes versus expressed choices as predictors of college major and career entry. *Journal of Counseling Psychology*, 1975, *27*, 117-121.

Ghiselli, E. E. *The validity of occupational aptitude tests*. New York, Wiley, 1966.

Ghiselli, E. E., and Barthol, R. P. The validity of personality inventories in the selection of employees. *The Journal of Applied Psychology*, 1953, *37*, 18-20.

Ginzberg, E., Ginsburg, S. W., Axelrod, S., and Herma, J. L. *Occupational choice: An approach to a general theory*. New York: Columbia University Press, 1951.

Grigg, A. E. Childhood experience and parental attitudes: A test of Roe's hypothesis. *Journal of Counseling Psychology*, 1959, *6*, 153-156.

Hagen, D. Careers and family atmosphere: A test of Roe's theory. *Journal of Counseling Psychology*, 1960, *7*, 251-256.

Harding, F. D., and Bottenberg, R. A. Effect of personal characteristics on relationships between attitudes and job performance. *Journal of Applied Psychology*, 1961, *45*, 428-430.

Henry, E. R. *Research conference on the use of autobiographical data as psychological predictors*. Greensboro, N. C.: The Richardson Foundation, 1965.

Holland, J. L. Some explorations with occupational titles. *Journal of Counseling Psychology*, 1961, *8*, 82-87.

Holland, J. L. Some explorations of a theory of vocational choice: I. One- and two-year longitudinal studies. *Psychological Monographs*, 1962, *76*(26).

Holland, J. L. Some explorations of a theory of vocational choice and achievement: II. A four-year prediction study. *Psychological Reports*, 1963, *12*, 545-594.

Holland, J. L. *Explorations of a theory of vocational choice: V. A one-year prediction study*. Moravia, N. Y.: Chronicle Guidance Professional Service, 1964.

Holland, J. L. A psychological classification scheme for vocations and major fields. *Journal of Counseling Psychology*, 1966, *13*, 278-288.

Holland, J. L. Explorations of a theory of vocational choice: VI. A longitudinal study using a sample of typical college students. *Journal of Applied Psychology*, 1968, *52*, No. 1, part 2, 1-37.

Holland, J. L. *The self-directed search*. Palo Alto, Calif.: Consulting Psychologists Press, 1971.

Holland, J. L. *Making vocational choices: A theory of careers*. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1973.

Holland, J. L., and Gottfredson, G. D. Applying a typology to vocational aspirations. Report No. 176. Center for Social Organization of Schools, The Johns Hopkins University, 1974.

Holland, J. L., and Lutz, S. W. The predictive value of a student's choice of vocation. *Personnel and Guidance Journal*, 1968, *46*, 428-434.

Holland, J. L., and Nichols, R. C. Explorations of a theory of vocational choice: III. A longitudinal study of change in major field of study. *Personnel and Guidance Journal*, 1964, *43*, 235-242.

Holland, J. L., Sorensen, A. B., Clark, J. P., Nafziger, D. H., and Blum, F. D. Applying an occupational classification to a representative sample of work histories. *Journal of Applied Psychology*, 1973, *58*, 34-41.

Holland, J. L., and Whitney, D. R. Changes in the vocational plans of college students: Orderly or random? *ACT Research Report, No. 26*, Iowa City, Iowa: American College Testing Program, 1968.

Hutchinson, T. S., and Roe, I. A. Studies of occupational history: Part II, attractiveness of occupational groups on the Roe system. *Journal of Counseling Psychology*, 1968, *15*, 107-110.

Kirkpatrick, J. J. Background factors that lead to executive success. *American Psychologist*, 1960, *15*, 477.

Lockwood, H. C., and Parsons, S. O. Relationship of personal history information to the performance of production supervisors. *Engineering Industrial Psychology*, 1960, *2*, 20-26.

McArthur, C., and Stevens, L. B. The validation of expressed interests as compared with inventoried interests: A fourteen-year follow-up. *Journal of Applied Psychology*, 1955, *39*, 184-189.

McLaughlin, D. H., and Tiedeman, D. V. Eleven-year career stability and change as reflected in Project TALENT data through the Flanagan, Holland, and Roe occupational classification systems. *Journal of Vocational Behavior*, 1974, *5*, 177-196.

Meir, E. I. Empirical test of Roe's structure of occupations and an alternative structure. *Journal of Counseling Psychology*, 1970, *17*, 41-48.

Mosel, J. N., and Wade, R. R. A weighted application blank for reduction of turnover in department store sales clerks. *Personnel Psychology*, 1951, *4*, 177-184.

National Science Foundation. *Two years after the college degree*. NSF 63-26, Washington, D. C.: United States Government Printing Office, 1963.

Norris, L., and Katz, M. The measurement of academic interests. Part II: The predictive validities of Academic Interest Measures. ETS Research Bulletin 70-67, Princeton, N. J.: Educational Testing Service, 1970.

Norton, J. L. Current status of research on vocational development. Pp. 186-199 in H. J. Peters, and J. C. Hansen, (Eds.), *Vocational guidance and career development* (2nd ed.). New York: MacMillan, 1971.

Osipow, S. H. *Theories of career development*. New York: Appleton-Century-Crofts, 1968.

Richards, J. M. Jr. Who studies what major in college? Paper presented at 1970 American Psychological Association meetings.

Roe, A. *The psychology of occupations*. New York: John Wiley, 1956.

Roe, A., Hubbard, W. D., Hutchinson, T. E., and Bateman, T. Studies of occupational history: Part I, job changes and the classification of occupations. *Journal of Counseling Psychology*, 1966, *13*, 387-393.

Roe, A., and Hutchinson, T. E. Studies of occupational history: Part III. The stability of occupational groups of the Roe system. *Journal of Counseling Psychology*, 1969, *16*, 390-395.

Roe, A., and Siegelman, M. The origin of interests. *IGPA Inquiry Studies*, No. 1. Washington, D. C.: American Personnel and Guidance Association, 1964.

Schuh, A. J. The predictability of employee tenure: A review of the literature. *Personnel Psychology*, 1967, *20*, 133-152.

Schwab, D. P., and Oliver, R. L. Predicting tenure with biographical data: Exhuming buried evidence. *Personnel Psychology*, 1974, *27*, 125-128.

Sharp, L. M., and Krasnegor, R. B. *Five years after the college degree: Part II—employment*. Bureau of Social Science Research, Washington, D. C., 1966.

Shott, G. L., Albright, L. E., and Glennon, J. R. Predicting turnover in an automated office situation. *Personnel Psychology*, 1963, *16*, 213-219.

Shoben, W. J. *Occupational careers* (2nd ed.). Chicago: Aldine, 1974.

Strong, E. K., Jr. Predictive value of the vocational interest test. *Journal of Educational Psychology*, 1935, *26*, 331-349.

Strong, E. K., Jr. *Vocational interests of men and women*. Stanford: Stanford University Press, 1943.

Strong, E. K., Jr. Validity of occupational choice. *Educational and Psychological Measurement*, 1953, *13*, 110-121.

Strong, E. K., Jr. *Vocational interests 18 years after college*. Minneapolis: University of Minnesota Press, 1955.

Super, D. E., Crites, J. O., Hummel, R. C., Moser, H. P., Overstreet, P. L., and Warnath, C. F. *Vocational development: A framework for research*. New York: Bureau of Publications, Teachers College, Columbia University, 1957.

Super, D. E., Kowalski, R. S., and Gotkin, E. H. *Floundering and trial after high school*. New York: Teachers College Press, 1970.

Super, D. E., Starishevsky, R., Matlin, N., and Jordaan, J. P. Career development: Self-concept theory. *Research Monograph No. 4*. New York: College Entrance Examination Board, 1963.

Switzer, D. K., Grigg, A. E., Miller, J. S., and Young, R. K. Early experiences and occupational choice: A test of Roe's hypothesis. *Journal of Counseling Psychology*, 1962, *9*, 45-48.

Utton, A. C. Recalled parent-child relations as determinants of vocational choice. *Journal of Counseling Psychology*, 1962, *9*, 49-53.

Whitney, D. R. Predicting from expressed vocational choice: A review. *Personnel and Guidance Journal*, 1969, *48*, 279-286.

Section VI

Adkins, D. C. *Test construction: Development and interpretation of achievement tests* (2nd ed.). Columbus, Ohio: C. E. Merrill, 1974.

Asher, J. J. The biographical item: Can it be improved? *Personnel Psychology*, 1972, *25*, 251-269.

Astin, A. W., and Panos, R. J. *The educational and vocational development of college students*. Washington, D. C.: American Council on Education, 1969.

Baehr, M., and Williams, G. B. Underlying dimensions of personal background data and their relationship to occupational classification. *Journal of Applied Psychology*, 1967, *51*, 48-59.

Baehr, M. E., and Williams, G. B. Prediction of sales success from factorially determined dimensions of personal background data. *Journal of Applied Psychology*, 1968, *52*, 98-103.

Baird, L. L. The relations of vocational interests to life goals, self-ratings of ability and personality traits, and potentials for achievement. *Journal of Educational Measurement*, 1970, *7*, 233-239.

Berdie, R. F. Intra-individual variability and predictability. *Educational and Psychological Measurement*, 1961, *21*, 663-676.

Berdie, R. F. Intra-individual temporal variability and predictability. *Educational and Psychological Measurement*, 1969a, *29*, 235-257.

Berdie, R. F. The consistency and generalizability of intra-individual variability. *Journal of Applied Psychology*, 1969b, *53*, 35-41.

Centers, R. *The psychology of social classes*. Princeton, N. J.: Princeton University Press, 1949.

Cooley, W. W., and Lohnes, P. R. *Multivariate procedures for the behavioral sciences*. (2nd ed.). New York: Wiley, 1971.

Cronbach, L. J. *Essentials of psychological testing* (3rd ed.). New York: Harper and Row, 1970.

Dunnette, M. D. A modified model for test validation and selection research. *Journal of Applied Psychology*, 1963, *47*, 317-332.

Dunteman, G. H. Organizational conditions and behavior in 234 industrial manufacturing organizations. *Journal of Applied Psychology*, 1966, *50*, 304-305.

England, G. W. *Development and use of weighted application blanks* (rev. ed.). Minneapolis: Industrial Relations Center, University of Minnesota, 1971.

Fiske, D. W., and Rice, L. N. Intra-individual response-variability. *Psychological Bulletin*, 1955, *52*, 217-250.

Flanagan, J. C., et al. Project TALENT one-year follow-up studies. Palo Alto, Calif.: Project TALENT Office, American Institutes for Research, 1966.

Flaugher, R. L., and Rock, D. A. A multiple moderator approach to the identification of over- and under-achievers. *Journal of Educational Measurement*, 1969, *6*, 223-228.

Freeberg, N. E., and Rock, D. A. Factorial invariance of biographical factors. *Multivariate Behavioral Research*, 1969, *4*, 195-210.

Ghiselli, E. E. The prediction of predictability. *Educational and Psychological Measurement*, 1960a, *20*, 3-8.

Ghiselli, E. E. Differentiation of tests in terms of the accuracy with which they predict for a given individual. *Educational and Psychological Measurement*, 1960b, *20*, 675-684.

Ghiselli, E. E. Moderating effects and differential reliability and validity. *Journal of Applied Psychology*, 1963, *47*, 81-86.

Gocka, E. F. Regression analysis of proportional cell data. *Psychological Bulletin*, 1973, *79*, 25-27.

Gullahorn, J. E. Multivariate approaches in survey data processing: Comparisons of factor, cluster, and Guttman analyses and of multiple regression and canonical correlation methods. *Multivariate Behavioral Research Monographs*, No. 67-1, 1967.

Hackman, R. J., Wiggins, N., and Bass, A. R. Prediction of long term success in doctoral work in psychology. *Educational and Psychological Measurement*, 1970, *30*, 365-374.

Hobart, R., and Dunnette, M. D. Development of moderator variables to enhance the predictions of managerial effectiveness. *Journal of Applied Psychology*, 1967, *51*, 50-64.

Holland, J. L., and Richards, J. M., Jr. Academic and nonacademic accomplishment in a representative sample of students taking the American College Tests. *College and University*, 1967, *43*, 60-71.

Horst, P. A technique for the development of a differential prediction battery. *Psychological Monographs*, 1954, *68*, No. 9, whole number 380.

Horst, P. A technique for the development of a multiple absolute prediction battery. *Psychological Monographs*, 1955, *69*, No. 5, whole number 390.

Horst, P. *Psychological measurement and prediction*. Belmont, Calif., Wadsworth, 1966.

Jorgenson, D. O. Prediction of predictability in the multivariate case. *Journal of Educational Measurement*, 1970, *7*, 175-184.

Kipnis, D. Some determinants of supervisory esteem. *Personnel Psychology*, 1960, *13*, 377-391.

Klein, S. P., Rock, D. A., and Evans, F. R. The use of multiple moderators in academic prediction. *Journal of Educational Measurement*, 1968, *5*, 151-160.

Kuder, F. Some principles of interest measurement. *Educational and Psychological Measurement*, 1970, *30*, 205-226.

Lindquist, E. F. *Educational measurement*. Washington, D. C.: American Council on Education, 1951.

March, J. G., and Simon, H. A. *Organizations*. New York: Wiley, 1958.

McNemar, Q. Moderation of a moderator technique. *Journal of Applied Psychology*, 1969, *53*, 69-72.

Owens, W. A., Glennon, J. R., and Albright, L. E. American Psychological Association Scientific Affairs Committee, Division 14. *A catalog of life history items*. Greensboro, N. C.: The Richardson Foundation, 1966.

Robinson, J. P., Rusk, R., and Rush, K. B. *Measures of political attitudes*. University of Michigan Survey Research Center, Institute for Social Research, 1969.

Rock, D. A. Appropriate method for the least squares analysis of categorical data. *Psychological Bulletin*, 1974, *81*, 1012-13.

Rock, D. A., Baird, L. L., and Linn, R. L. Interaction between college effects and students' aptitudes. *American Educational Research Journal*, 1972, *9*, 149-161.

Rock, D. A., Barone, J. L., and Linn, R. L. A fortran computer program for a moderated stepwise prediction system. *Educational and Psychological Measurement*, 1967, *27*, 709-713.

Ronan, W. W., and Prien, E. P. *Perspectives on the measurement of human performance*. New York: Appleton-Century-Crofts, 1971.

Smith, D. Correcting for social desirability response sets in opinion-attitude survey research. *Public Opinion Quarterly*, 1967, *31*, 87-94.

Ward, J. H., Jr. Hierarchical grouping to optimize an objective function. *Journal of the American Statistical Association*, 1963, *58*, 236-244.

Werts, C. E., and Linn, R. L. Causal assumptions in various procedures for the least square analysis of categorical data. *Psychological Bulletin*, 1971, 75, 430-431.

Zedeck, S. Problems with the use of "moderator" variables. *Psychological Bulletin*, 1971, 76, 295-310.

Section VII

Baird, L. L., and Richards, J. M., Jr. The effects of selecting college students by various kinds of high school achievement. *ACT Research Report No. 23*. Iowa City, Iowa: American College Testing Program, 1968.

Cronbach, L. J. *Essentials of psychological testing* (3rd ed.). New York: Harper and Row, 1970.

Cronbach, L. J., and Gleser, F. C. *Psychological tests and personnel decisions*. Urbana, Ill.: University of Illinois Press, 1957.

Dailey, C. A. The life history as a criterion of assessment. *Journal of Counseling Psychology*, 1960, 7, 20-23.

Hahn, M. E. *Planning ahead after forty: The process of psychoevaluation with self-study projects*. Beverly Hills, Calif.: Western Psychological Services, 1969.

Holland, J. L. *The self-directed search*. Palo Alto, Calif.: Consulting Psychologists Press, 1971.

Hoyt, D. P., and Munday, L. A. *Your college freshmen*. Iowa City, Iowa: American College Testing Program, 1968.

Lutz, S. W. Do they do what they say they will do? *ACT Research Report No. 24*. Iowa City, Iowa: American College Testing Program, 1968.

Shannon, C. E. A mathematical theory of communication. *Bell System Technical Journal*, 1949, *27*, 379-423.

Tyler, L. T. *The work of the counselor* (2nd ed.). New York: Appleton-Century-Crofts, 1961.